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Oat History, Identification and Classification

Technical Bulletin No. 1516



United States
Department of
Agriculture

Agricultural
Research
Service

Oat History, Identification and Classification

By **FRANKLIN A. COFFMAN**
Formerly principal research agronomist

Technical Bulletin No. 1516

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This publication is a revision of and supersedes Technical Bulletin No. 1100, "Oat Identification and Classification," by T. R. Stanton.

Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

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Oat History, Identification and Classification

By FRANKLIN A. COFFMAN,¹ formerly principal research agronomist, Agricultural Research Service, United States Department of Agriculture

INTRODUCTION

Oat culture in North America extends from Alaska southward well into Mexico. Such a wide geographic distribution is possible only because of the diversity in morphological and ecological types of oats available. Varietal types grown in a region are determined primarily by the climate that prevails in that region and by the ecological characteristics of the varieties. Because of the rapid changes in disease prevalence in America, the change in oat varieties grown has been rapid. A variety may be grown on large acreages one year and be dropped almost completely 2 or 3 years later because it is susceptible to some diseases.

The first comprehensive classification of oat varieties in America was published by Etheridge (1916), and the second by Stanton (1955).² General descriptions of many older and recent released varieties that have been registered by the American Society of Agronomy are available in the *Agronomy Journal*, in its predecessor, *The Journal of the American Society of Agronomy*, and in *Crop Science*. Descriptions of Canadian oats are available in looseleaf form in the *Handbook of Canadian Cereal Varieties of Barley, Field Beans, Flax, Oats, Spring Wheat, and Winter Wheat*.

My interest and observation of oats started in 1917 and close scrutiny of morphological characters of oats dates back to 1919, with a study on variability in the oat variety Burt conducted at Akron, Colo., and Manhattan, Kans. This study was continued in 1920 and 1921 in cooperation with others, and results published in 1925 (Coffman, Parker, and Quisenberry 1925).

A similar study of variability in the Kherson oat was conducted at Akron, Colo., 1921-23, and results were also published in 1925 (Coffman and Stanton 1925).

On January 1, 1924, I transferred from Colorado to Washington, D.C., to assist T. R. Stanton with Oat Project Investigations. In 1935, under the direction of Dr. Stanton, work on oat classification

¹ Retired.

² Year in italics after author's name indicates reference in Literature Cited, p. 339.

started at the Aberdeen Substation, Aberdeen, Idaho, and elsewhere. These studies continued from 1935 to 1940.

World War II drastically reduced travel funds for Department personnel, and the study of oat classification at Aberdeen was suspended. In 1955 Dr. Stanton's publication, "Oat Identification and Classification," U.S. Dept. Agr., Technical Bulletin 1100, was published. Because of the restrictions on travel during World War II and later, this publication includes practically no oat varieties released in the United States after 1940-41.

Realizing that many oat varieties had been released during the long period from 1941 to 1955, Dr. H. C. Murphy, Stanton's successor as leader of the Department's Oat Investigations, suggested that I renew efforts in oat classification. The work reported here includes information on varieties released through 1972.

After 1955, Dr. H. C. Murphy (deceased) and Dr. L. W. Briggles, who succeeded him as leader of Oat Investigations, assisted in outlining and conducting the studies with oat classification; Harland Stevens and Frank Petr of the Aberdeen Substation, Aberdeen, Idaho, Dr. J. C. Craddock, Wendel Headley, William Becker (deceased), and Roger T. Smith, all of the then Plant Industry Station, Beltsville, Md., and many others at the State experiment stations are all gratefully acknowledged for their assistance in preparing the manuscript for publication. In 1972 the Plant Industry Station's name was changed to Beltsville Agricultural Research Center-West (BARC-W).

Since 1962, oat varieties have been grown at the Aberdeen, Idaho Experiment Station and at the then Plant Industry Station, Beltsville, Md., and morphological descriptions assembled from information obtained on oat plants grown at these two locations.

Comparatively few agronomists realize that although Stanton's classification report was published in 1955, his "cutoff" date for varieties included was 1940-41, almost 15 years before publication. This oat classification publication presents information and descriptions of those oat varieties released in the United States from 1940-41 through 1972. In addition, several older varieties released before that period are also included.

In the past 30 years, many new oat varieties have become available in North America. Because many of these varieties are similar, their morphological characters must be described and they must be classified. Today, practically all oats released to growers are hybrids. Many were not selected over a sufficiently long time to become genetically homozygous for all morphological characters before release. Thus, accurate identification is sometimes difficult.

THE CLASSIFICATION OF OATS

History

The morphologic study of oats is not new. According to Malzew (1930), the first person to describe oats was Tournefort who in 1700 established the genus *Avena*. Later Linnaeus (1753) described four oat species: *Avena sterilis*, *A. fatua*, *A. sativa*, and *A. nuda*. Linnaeus classified oats as wild or cultivated, and among the cultivated oats he differentiated only the covered from the naked.

A knowledge of the derivation and meaning of the Latin names given the different species by Linnaeus helps in understanding their classifications. The word *Avena* to denote oats was apparently used by the Latin countries long before either Tournefort or Linnaeus. As stated by Denaiffe and Sirodot (1901):

The derivation of the Latin word *Avena* remains somewhat obscure. It seems probable that it is from the Latin word Aveo (to desire), that is to say, forage desired by all animals. The syllable *Av* in its composition is found in a number of languages. The syllable *se* is found in Sanskrit in the sense to supply food. *Ava* nourishment, *Avasa* pasturage, a word assumed to be equivalent to the Russian word *Ovesu*, the Polish *Oweis*, the Rumanian word *Ovesia* and the Serbian word *Ovas*.

Thus, it is clear that oats were first used as a pasturage or forage crop in southern Europe long before they were grown for grain.

Malzew (1930) indicated that the word *sterilis* probably was used because the seed of that species often drops off during the yellow ripe stage. He mentioned that in several classics, weed oats go by such names as *A. vanus*, and *A. sterilis*.

So far as we can determine, the word *fatua* was first used by Linnaeus. Its apparent meaning is, in general, similar to that of the word *fatuous*, meaning false, meaningless, or without worth or value. Consequently, it is descriptive in the same way as is *sterilis*.

The word *nuda* is as readily understood in English as it is in Latin; it means naked or without covering.

The dictionary (G. and C. Merriam Co. 1934) defines *sativa* as follows: "*Sativa* (sativ) adj. [L. *sativus* fr. *serere*, *satum* to sow] sown; cultivated, Obs." Hence, the names Linnaeus used to describe species become clear. He included the entire polymorphic group of covered cultivated oats in a single "*sativa*" group, without further distinction. Although *A. nuda* is also a cultivated oat, Linnaeus designated it as a separate species, thus ranking it equally with *A. sterilis*, *A. fatua*, and *A. sativa*.

Etheridge (1916) states, "The review and discussion of the work

of others has shown that a classification of varieties of oats, in order to be effective, must be based on the morphology of the plant."

The dictionary (Webster's Second 1934) indicates morphology is:

The branch of biology dealing with the form and structure of plants: the science of structural organic types: the study of the forms, relations, metamorphosis, and phytogenetic development of organs apart from their functions. ... includes anatomy, histology and organography, and also the nonphysiologic aspects of cytology and embryology. ... sometimes restricted to external form—called structural botany, their internal morphology to external form—called structural botany, their internal morphology being known as plant anatomy.

Previous Classification

Many attempts to classify oats have been made since Linnaeus. The methods used have differed widely, especially as to the importance accorded primary morphologic characters, and those characters useful in distinguishing the groups and subgroups. Some so-called classifications have depended primarily on rather minute descriptions of the varieties rather than on a systematic key of the different morphologic characters.

Linnaeus (1753) described all cultivated oats as *Avena sativa* L. Later such oats were differentiated according to the shape of the panicle. Schrieber assigned the name *A. sativa* ssp. *orientalis* to those cultivated oats having unilateral, "side panicles," and still later Ascherson and Grabner assigned the name *A. sativa* ssp. *diffusia* to cultivated oats with diffused, spreading or "tree-type" panicles (Schultz 1913a, b).

Not all European writers accepted this classification of *Avena*, but it was accepted by English, American, and many other oat scientists during the past half century, if not before.

Koch (1848) pointed out that the derivatives of *A. sterilis* differed morphologically from most cultivated oats then considered to be *A. sativa*, derived from *A. fatua*. Because of their geographic source (apparently Turkey and the Mediterranean area) Koch designated these *A. sterilis* derivatives as *A. byzantina*.

Who first indicated that *A. sativa* oats were derived from *A. fatua* is not known. Such a theory had probably been presented before 1848 as Koch (1848) must have had some reason for pointing out the difference between *A. byzantina* and other cultivated oats. In 1852, Lawson and Son (1852) of England indicated their disbelief in the theory that *A. sativa* was derived from *A. fatua*. They stated:

This is supposed to be the original form from which all varieties of *Avena sativa* were derived, although there is no proper reason for such a supposition, the probability of such a supposition may well be questioned. Hunter (1924) (also of England) stated: It has been stated frequently that *Avena fatua* is the wild form from which *Avena sativa* originally sprang, but whether this claim is the result of bold conjecture or the exercise of comparisons with other plants and their ancestors, it is not easy to determine. In point of fact no evidence to support the contention is presented and it is only within recent years that an elucidation of the problem has been attempted.

Cosson (1854), in his classification of oat species, listed *A. byzantina* (Koch) along with *A. hybrida* (Peters.) as being synonymous with *A. fatua* var. *glabrescens*. Cosson ignored Koch's reason for differentiating *A. byzantina* and did not cite the paper by Lawson and Son (1852). Haussknecht (1885) prepared critical descriptions of the characters of *Avena*; and Kornicke and Werner (1885) (according to Etheridge 1916) published the first comprehensive, systematic study of cultivated oats. Singularly enough, Haussknecht, Kornicke and Werner, and Etheridge, all fail to mention Koch's paper or his *A. byzantina* theory. Nevertheless, they were the first to differentiate varieties primarily by use of definite morphologic characters. Atterberg (1891) classified oats, basing his major groups primarily on kernel size and number of kernels. His classification, therefore, does not contribute much from the strictly morphologic standpoint.

Denaiffe and Sirodot (1901) published an extensive classification of oats. The primary characters they considered were the relative form and the size of grains, based on actual measurements and weights. The value of such a classification is questionable. Such considerations as kernel width are subject to much change because of environmental conditions.

Nilsson (1901) classified oats, basing his distinctions primarily on form of panicle, color, number of grains per spikelet, length of maturing period, and form of grain. The chief difficulty was the differentiation of many different panicle types. Because panicle type may differ with stage of maturity, it often is unsatisfactory as a main division in classification.

In 1908-09, Bohmer (1910) classified oats, using primarily a combination of the Nilsson and Atterberg systems—the panicle type of Nilsson and spikelet and grain type of Atterberg. His system, as a consequence, had the combined weaknesses of both their classification systems and is not satisfactory morphologically.

During the decade 1908-17, Trabut (1914), Thellung (1912), and Schulz (1913*a, b*) published information and described the morphologic characters of use in the classification of oats. All these

investigators referred to Koch (1848), but Thellung (1912) and Schulz (1913a, b) pointed out the diversity of *A. byzantina* and mentioned the "sativalike" individuals among those classed as *A. byzantina*. Zade (1918) referred to this, also, and recognized *A. byzantina*. But apparently, he still believed that *A. sativa* was derived from *A. fatua*.

Etheridge (1916) published the first oat classification to appear in America. Marquant (1922), Archer (1922), and Hunter (1924) took no note of Koch's (1848) contribution, and all followed in general the classification of oats used by Etheridge. Koch's theory was not mentioned by these writers although all of them cited German publications that referred to Koch in their classifications.

Thus, Koch's ideas so far as those writing in English were concerned, remained unknown to most English investigators until Coffman and others in 1925 first mentioned Koch and his use of *A. byzantina*. They pointed out that Koch's work had been overlooked for more than 75 years by English writers.

De Villiers and Sim (1930) published the first classification in English that included reference to *A. byzantina*.

Sampson (1954) wrote on the origin rather than the classification of oats and he acknowledged Koch's contribution. Stanton (1955) gave full recognition to *A. byzantina* in his classification, but he followed Etheridge quite closely as to morphologic characters.

A review of the literature indicates that during the nearly 40-year span (1916-55) from Etheridge (1916) until Stanton (1955), only two other comprehensive classifications of oats were published. Both appeared in Europe, one in Russian (Malzew 1930) and one in Portuguese (Taborda de Morais 1939).

In these two European classifications, *A. byzantina* is accorded the place in each that Koch (1948) indicates it should hold.

THE SPECIES OF *AVENA*

Oats belong to the genus *Avenae* of the family *Gramineae*. In *Avena* the addition of genomes has been of utmost importance in speciation. Polyploidy implies a reduplication of genes; thus it is a restrictive influence on morphologic differentiation. In oats, the species have either $n = 7$, $n = 14$, or $n = 21$ chromosomes. Those oats of widest interest, especially from the economic viewpoint, have $n = 21$ chromosomes or include three genomes of $n = 7$ chromosomes each; thus, they are hexaploids. This study is confined almost exclusively to the hexaploid species of *Avena*. However, the diploid and tetraploid species are also mentioned.

Oat species are classed cytologically according to the number of chromosomes in their cells: Diploids ($2n=14$), tetraploids ($2n=28$), or hexaploids ($2n=42$). The diploids and tetraploids are often referred to as minor species. They are of botanical interest primarily because they are of much less economic importance than the hexaploids in the United States and throughout the world. Practically speaking, the hexaploids are of primary interest among cereals as a world crop. However, some mention usually is made of the minor species in oat classifications, especially in continental European publications, but much less so in American and English publications.

O'Mara (1961) in reviewing the literature on the cytogenetics of *Avena* listed the species as follows:

Diploids, $n=7$	Tetraploids, $n=14$	Hexaploids, $n=21$
<i>A. clauda</i>	<i>A. barbata</i>	<i>A. fatua</i>
<i>A. pilosa</i>	<i>A. wiestii</i>	<i>A. sativa</i>
<i>A. longiglumis</i>	<i>A. vaviloviana</i>	<i>A. nuda</i>
<i>A. ventricosa</i>	<i>A. abyssinica</i>	<i>A. sterilis</i>
<i>A. strigosa</i>		<i>A. byzantina</i>
		<i>A. orientalis</i>
		<i>A. ludoviciana</i>

The Minor Species of *Avena*

In two publications on the classification of oat varieties in the United States, Etheridge (1916) mentioned three minor species and Stanton (1955) six. Each author gave some botanical description of the species he mentioned. The minor species included by Stanton are:

Botanical name	Common name
Diploid ($7n$) ($2n=14$):	
<i>Avena brevis</i> , Roth	Short oat ¹
<i>Avena strigosa</i>	Sand oat ¹
<i>Avena wiestii</i>	Desert oat
<i>Avena nudabrevis</i> Vavilov	Small hull-less (or naked)
Tetraploid ($14n$) ($2n=28$):	
<i>Avena barbata</i> Brot.	Slender oat
<i>Avena abyssinica</i> Hochst.	Abyssinian oat ¹

¹ Mentioned also by Etheridge (1916).

Since Stanton's classification was published in 1955, a third tetraploid species of *Avena*, *A. magna* Murphy and Terrell, was

discovered, named, and described by Murphy and others (1968). Apparently, *A. magna* is the only so-called minor species of *Avena* to be published on in America. These writers suggest that since many of the morphological characters of tetraploid *A. magna* are similar to those of the hexaploid *A. sterilis*, it may possibly be its progenitor. However, *A. magna* is a tetraploid, whereas *A. sterilis* is a hexaploid. They do not postulate as to how the derivation could have resulted.

Seed of *A. magna* (Murphy, Sadanaga, Zillinsky 1968) was received in the United States by H. C. Murphy (deceased) of the Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md., from F. J. Zillinsky of the Canadian Department of Agriculture, Research Station, Ottawa, Canada.

Zillinsky and others (1961) obtained seed of many *Avena* plants differing in morphologic characters in Israel and the Mediterranean. This new species, *A. magna*, is being studied with marked interest.

Ladizinsky (1971) described a second new tetraploid species, *A. murphyi*, which he collected in southern Spain in 1969. It has close morphological affinity to *A. sterilis* and *A. magna*, but is cytologically incompatible with both.

Among the seven minor species mentioned, only two, the diploid *A. strigosa* and the tetraploid *A. barbata*, are found growing to any extent in the United States. Others have been limited presumably to experimental areas or to greenhouse culture.

These two species of oats may have been first introduced into Mexico and from there into the United States some 200 years ago, or even longer, by the Spanish soldiers and clergy who are known to have introduced seed of many crops from their native areas to the New World. Oats were used as feed for their horses and possibly to a lesser extent for human food. Varieties of oats are a comparatively new development in the history of man, and it is quite clear the oats introduced by the Spanish were mixtures of different morphologic types as well as different species. This fact was indicated by studies made by Hendry (1931) of seeds of differing species and varieties of seed-bearing plants including oats, found imbedded in the adobe bricks taken from the ruins of early Spanish missions located in northern Mexico as well as in southern California.

Stanton (1961) quoted C. A. Suneson, then of the University of California Agricultural Experiment Station and the U.S. Department of Agriculture, as indicating that range specialists of California estimated that on some 10,000,000 acres in foothill areas of that State wild oats were of considerable economic importance for

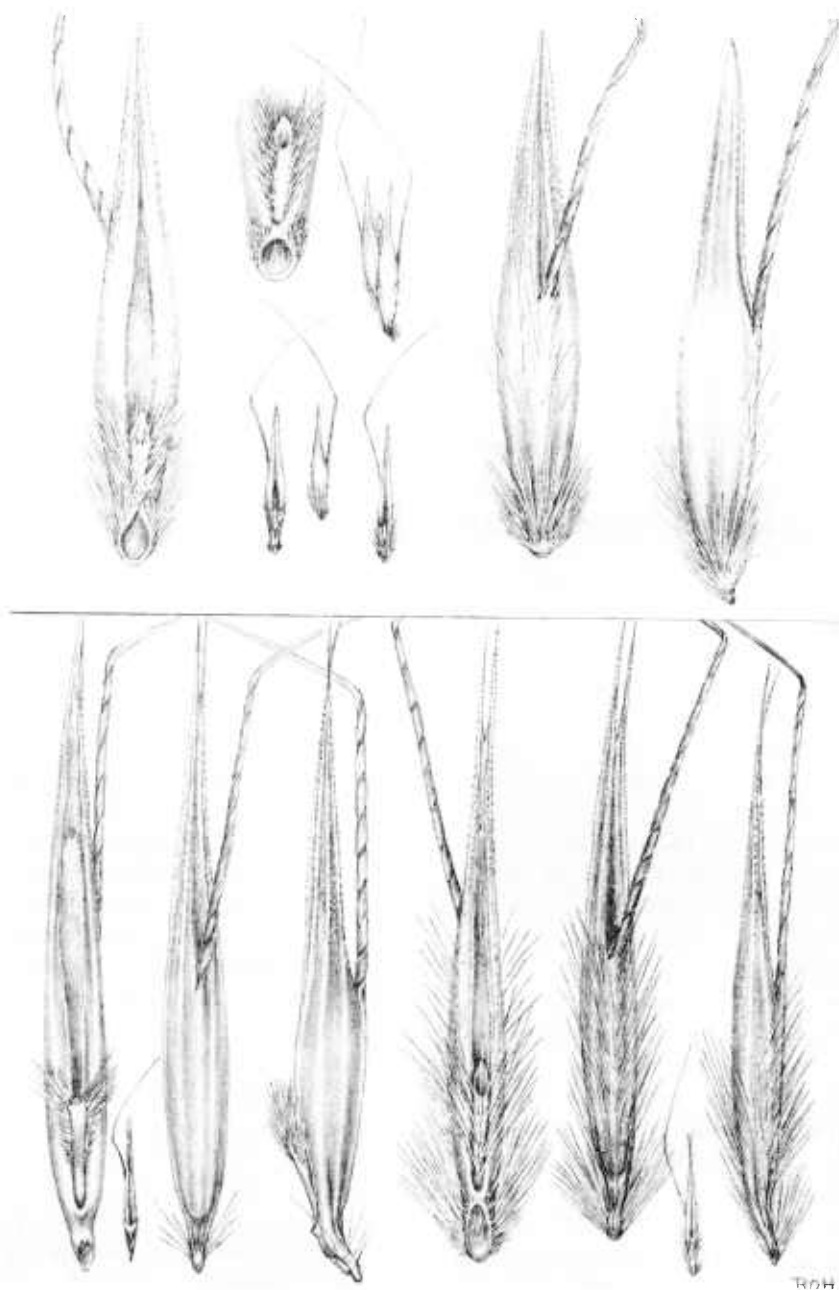
pasturage and forage. Apparently the most common species by far was the hexaploid *A. fatua*, but the diploid *A. strigosa* and tetraploid *A. barbata* were also present (fig. 1). The relative importance of these minor species was not fully indicated but *A. barbata* was apparently more prevalent than *A. strigosa* in California and adjacent areas in the last 10 to 15 years. Plants of those two species were noted growing beside railway tracks and highways in some areas of California. Consequently, in this publication considerable information is given on these two minor species of oats, *A. strigosa* and *A. barbata*. The reader is referred also to the three publications, Etheridge (1916) and Stanton (1955, 1961), for more information on the other five minor species listed.

***Avena strigosa* Schreb. (Sand oat)**

Juvenile growth semiprostrate to erect; leaves dark green, medium narrow, usually glabrous but may be somewhat pubescent.

Adult plant: Early to midearly; culms 2-5 slender, midtall (75-125 cm), moderately stiff; nodes frequently brown in color, usually glabrous, but slight pubescence may be present; leaves dark green, midlong and midwide, nonpubescent; panicle usually fully exserted, equilateral, midsize, 12-20 cm long, 7.5-8 cm wide; rachis usually flexuous, nodes 5-7, branches 10-16, slender, 4-8 cm long, usually somewhat drooping at outer ends; spikelets usually 2-flowered, 18-36 per panicle, separate from pedicel by fracture, very obscure or no scar at base of primary floret; outer glumes 18-24 mm long, fine texture, light green to slightly glaucous in early growth; first lemma, midlong 17-20 mm, all slender, biaristate (2 points 5-9 mm long), somewhat variable in color but usually gray to dull gray depending on growth conditions, usually 5-7 veins in lemma; second florets 10-16 mm long, biaristate, awns on all primary and most secondary florets, twisted and geniculate, 27-40 mm long on primary florets, first floret usually glabrous, but supporting rachilla segment of second floret very slender, glabrous, except for small tufts of pubescence, 3-5 mm long on opposite sides of apex (bifurcate appearance).

Marquand (1923) pointed out that the leaf sheaths of *A. strigosa* were pubescent. In the studies of Stanton (1955) and in the study reported here this condition was not pronounced. Also, Marquand indicated that because of the very slender rachis and relatively long branches in the panicle, branches tend to droop to one side and result in a somewhat unilateral-shaped panicle, resulting from this drooping characteristic of side branches. This appearance was also noted in some panicles of *A. strigosa*.



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FIGURE 1.—Florets of species of oats found growing in the United States: *Top*, *Avena fatua* found widely over Western States; *bottom, left*, *Avena strigosa* found in California; *right*, *Avena barbata* found in California.

Saia, C.I. 7010,³ *Avena strigosa*, is used as a "rust-tester" in the crown rust (*Puccinia coronata* f. sp. *avenae*) differential nurseries.

The oat was received in the United States from Canada. It originated in Brazil (Murphy, Sadanaga, Zillinsky 1968).

Saia differs somewhat morphologically from certain other oats belonging to *Avena strigosa* Schreb.

Saia

C.I. 7010

Juvenile growth intermediate, culms very slender, sheath and leaf margins nonpubescent, leaf medium narrow, medium light green.

Adult plant: Late, tall (130–145 cm) culms 2–3 very slender, nonpubescent, dark colored at nodes; leaf medium narrow, ligule present, medium light green; nonpubescent sheath and leaf margins; panicle medium short (17–18 cm) and midwide (7–8 cm); rachis very slender, straight, recurved at tip, 7–8 nodes, false node absent; branches (30–35) very slender, midlong (6–7 cm); usually straight to slightly drooping; spikelets 37–40; glumes very light red, midshort (17–18 mm), fine in texture; florets 1, only occasionally 2 fertile, separation by fracture, distal, basal scar absent, basal pubescence absent; lemma gray to black, short (12–13 mm), biaristate (2 points 3–5 mm long), nerves 7, prominent; palea narrow, gray to black; awns numerous, straight, and very slender; kernel slender; rachilla segment long (3–3.5 mm), very slender, nonpubescent; no hairs on back of lemma.

Avena barbata Brot. (Slender oat)

Juvenile growth prostrate to semiprostrate; plants short to midtall (70–115 cm), midseason to relatively late in maturity; culms slender, weak, glabrous to somewhat hairy at nodes; leaf sheaths dark green, pubescent; leaves usually narrow with margin ciliate; peduncles slender, weak, may not be fully exerted; panicles usually equilateral, medium in length and width; rachis flexuous, slender, often 5–8 nodes with short to midlong slender drooping branches; spikelets comparatively numerous with two and sometimes three florets; outer glumes 22–27 mm in length and light green in color, to somewhat glaucous before maturity; spikelets separating from pedicel by abscission leaving basal scar in pri-

³ Saia has additional C.I. numbers; C.I. 4639 is very similar morphologically but often has lighter (gray) lemmas.

C.I. refers to accession numbers of the Agricultural Research Service, U.S. Department of Agriculture.

mary floret; second and third florets when present, separating from supporting rachilla segments by disarticulation; primary floret very slender, midlong to long (16–24 mm); lemma gray to dark gray or brown in color, covered with midlong pubescence on basal portion and extending over the lower half, with two points (biaristate), 4–7 mm long; secondary florets shorter, otherwise similar to primary florets; awns numerous, present on all primary and most secondary florets, long (25–40 mm), twisted below bend or geniculation; second rachilla segment somewhat flattened, very pubescent, 3–5 mm long, with obscure cavities in second and third florets, with 5–7 rather prominent veins in lemmas producing a somewhat striped appearance.

Hexaploid *Avena* Species

Before Kihara (1919, 1924), the Japanese cytologist, all classifications of *Avena* had been based primarily, if not exclusively, on the morphologic characters of the plant specimens examined. Kihara's studies revealed the cytologic differences existing in oat species and subspecies. He revealed that cytologically, based on chromosome numbers, *Avena* (oats) are of three types: Diploids ($7n$); tetraploids ($14n$); and hexaploids ($21n$).

Since Kihara's papers appeared, morphologists have, in general, accepted his cytologic differentiation of *Avena* into the three major divisions, based on chromosome numbers and classified *Avena* accordingly. In America, and most other parts of the world where oats are grown, the "minor" (diploid and tetraploid) species are of comparatively little economic importance, whereas, the hexaploids are of major importance as a world agricultural crop.

For at least a century, the theory had prevailed, at least in England and America, that among the hexaploids, *A. sativa* was a derivative of the wild oat *A. fatua* L. whereas the commonly grown derivatives of the wild *A. sterilis* were usually designated as derivatives of *A. sterilis* without much, if any, further designation. Trabut of North Africa (1914), however, designated cultivated forms of *A. sterilis* as *A. sterilis culta*.

In Europe in 1948, Koch designated the cultivated derivatives of *A. sterilis* as *A. byzantina* (K. Koch). His paper apparently went unnoted in England, in certain European, North African, Australian, and other areas, and most certainly in America until 77 years later when Coffman, Parker, and Quisenberry (1925) stressed its importance. Since 1925 (Coffman and others 1925), the designation of derivatives of *A. sterilis* as belonging to *A. byzantina* has been accepted generally by English-speaking people as well as by others in other countries.

Coffman (1946) explained that the previously held assumption that the cultivated *A. sativa* was derived from the wild *A. fatua* L., as indicated by Haussknecht (1885) of Germany, was not well founded.

Later Coffman (1961) cited Lawson and Son (1852) and Hunter (1924) of England as having previously doubted the theory that *A. fatua* was the actual progenitor of *A. sativa*. However, they suggested no alternative proposals for the probable derivation.

Controversy followed publication of Coffman's theory. Certain writers ignored it entirely or attempted to refute the proposal, such as Sampson (1954). The idea that *A. sterilis* was the progenitor of all hexaploids was ridiculed by at least one Russian scientist. None of the writers who challenged the theory, however, presented any new concrete evidence in support of the formerly assumed theory for the derivation of *A. sativa* from *A. fatua*.

For some time after 1946, only the informal processed publication by Musil (1946), who reported to American seed analysts the results of her critical, microscopic study of the morphologic character of *Avena* specimens, was available to substantiate Coffman's theory. Musil pointed out the critical morphologic evidence for the belief that *A. sativa* was not derived from *A. fatua*. Musil's study had been made entirely independently of Coffman's study, and only after both had prepared their publications did they become aware of the similarity of their independent observations concerning *A. sativa* not being derived from *A. fatua*. Musil, however, did not postulate on the origin of all hexaploids, nor point out the relationship of the different hexaploid species as presented by Coffman (1946).

However, additional evidence in support of Coffman's theory was shortly presented in England by Griffiths and Johnston (1956) and later accepted and expanded upon by Jones (1956). Griffiths and Johnston (1956) reported that by use of X-ray they obtained *A. fatua*-type segregates as progeny from X-rayed *A. sterilis* L. and specifically point out that this was substantiating evidence in support of Coffman's (1946) theory of the derivation of all hexaploid *Avena* from the one wild source species, or *A. sterilis*. Since publication of Griffiths and Johnston's research in 1956, the controversy has subsided in America, and presumably elsewhere.

Consequently, after decades of study of the morphologic characters of *Avena*, together with evidence obtained personally, or by many others in the important fields of cytology, genetics, histology, physiology, and other fields, I made the first classification of hexaploids. This classification was made according to the theory that all other hexaploid *Avena* species, subspecies, and varieties

are derived from one source, *A. sterilis* L. A key for the species, subspecies, and varieties of hexaploid *Avena* of interest in North America follows.

Key to Species, Subspecies, and Varieties of Hexaploid *Avena*

	Name of species, subspecies and variety	Page
1a. Panicles equilateral, spreading (tree type).		
2a. Spikelets separate from peduncle by abscission.		
3a. Florets (2-4 per spikelet) separate by basifracture.		
4a. Glumes: Lemma and palea adhere to groat.		
5a. Awns present on all florets, twisted geniculate.		
6a. Awns pubescent below geniculation.	<i>Avena sterilis</i> L. var. <i>macrocarpa</i> (Moench.) Briq.	15
6b. Awns nonpubescent below geniculation.	<i>Avena sterilis</i> L. var. <i>maxima</i> (Perez Lara).	15
5b. Awns present on all florets, twisted geniculate on primary floret, often subgeniculate or straight on second and third florets.	<i>Avena sterilis</i> var. <i>Ludoviciana</i> (Durieu).	16
3b. Florets (2-4) separate by abscission, semiabscission or heterofracture.		
4a. Glumes: Lemma and palea adhere to groat.		
5a. Awns present on all florets, twisted geniculate.	<i>Avena sterilis</i> L. var. <i>intermedium</i> (Coffman).	18
3c. Florets (2-3) separate by abscission only.		
4a. Glumes: Lemma and palea adhere to groat.		
5a. Awns present on all florets, twisted geniculate.	<i>Avena fatua</i> L. -----	19
2b. Spikelets separate from peduncle by abscission, semiabscission, or heterofracture.		
3b. Florets (2-3) separate by basifracture or heterofracture.		
4a. Glumes: Lemma and palea adhere to groat.		
5b. Awns present on lower and often second floret twisted geniculate, subgeniculate or straight.	<i>Avena byzantina</i> (Koch)	21
2c. Spikelets separate from peduncle by fracture only.		
3c. Florets (2-3) separate by fracture, usually distal.		
4a. Glumes: Lemma and palea adhere to groat.		
5c. Awns usually present on first florets only, twisted geniculate, subgeniculate, straight or awns absent.	<i>Avena sativa</i> L. -----	23
1b. Panicles unilateral, nonspreading (side oats).		
2c. Spikelets separating from peduncle by fracture only.		

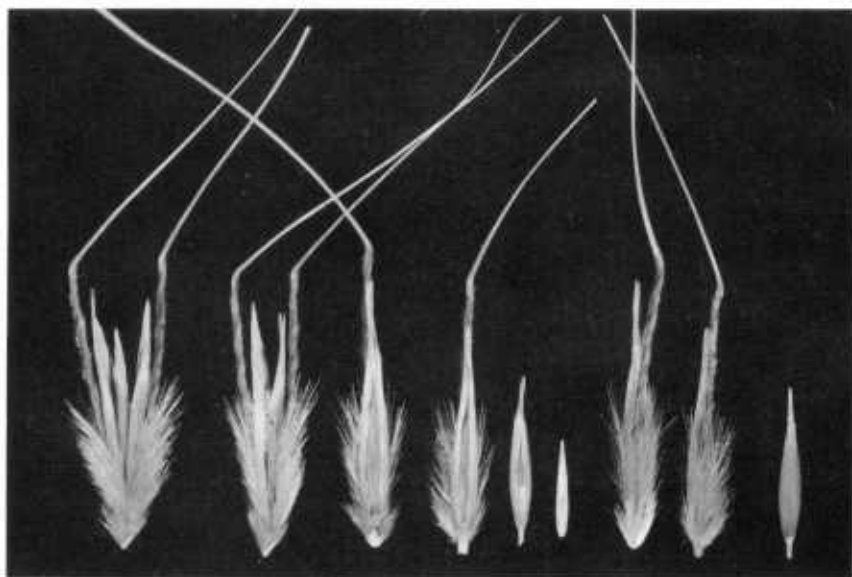
	<i>Name of species, subspecies, and variety</i>	<i>Page</i>
3c. Florets (2-4) separating by fracture almost exclusively distal.		
4a. Glumes: Lemma and palea adhere to groat.	<i>Avena sativa</i> L. ssp. <i>orientalis</i> (Schreb.)	24
1c. Panicles equilateral, spreading (tree type).		
2c. Spikelets separating from peduncle by fracture only.		
3b. Florets: Multiflorous (3-8 or more) separating usually by basifracture.		
4b. Glumes: Lemma and palea do not adhere to groat (groats loose within lemma and palea).	<i>Avena nuda</i> L. -----	25

***Avena sterilis* L. var. *macrocarpa* (Moench) Briq.**

Juvenile plant prostrate to semiprostrate; culms 2-6, stout; leaf sheath very pubescent. Adult plants 120-145 cm tall, somewhat decumbent, late, culms very pubescent above and below the nodes; leaf dark green, midwide, sheaths and margins pubescent; panicles large, widespread, 12-28 cm long; rachis long, slender, inclined to recurve at tip, with 10-20 medium to long, slender drooping branches; spikelets 12-40, decidedly large, widespread, pendant, 2-4 florets; outer glumes very long (35-45 mm), coarse in texture, light reddish; first (lower floret) lemma 25-40 mm long with prominent, large oblique, open basal scar, with dense, long (2-4 mm) pubescence on sides and back of basal scar area and extending half to two-thirds the length of the back and sides of the reddish to reddish brown, coarse-textured, lemma; connecting rachilla segment supporting second and segment supporting third floret extremely pubescent (2-4 mm); awns on first and second florets very long (40-80 mm) stout, twisted in lower fourth to third, bent or geniculate, covered with dense, short pubescence in area below geniculation; awns on third, and, when present, fourth and later florets, may be more slender, shorter and subgeniculate to straight; usually seven prominent nerves in reddish to brown lemma and palea reddish to brown in color (fig. 2). The caryopsis is long (12-14 mm) with a pronounced "brush" pubescence, at upper end.

***Avena sterilis* L. var. *maxima* (Perez Lara)**

Similar in most morphologic characters to *A. sterilis macrocarpa*, except culms somewhat more decumbent at base, outer glumes slightly (3-5 mm) longer, awns equally as long, stout and twisted, portion below geniculation (bend) is not covered with short, stiff, light-colored pubescence as in *A. sterilis macrocarpa* (fig. 3). This latter morphologic character is essential in differentiating the two species.



PN-4065

FIGURE 2.—Spikelets and florets of *Avena sterilis macrocarpa*.

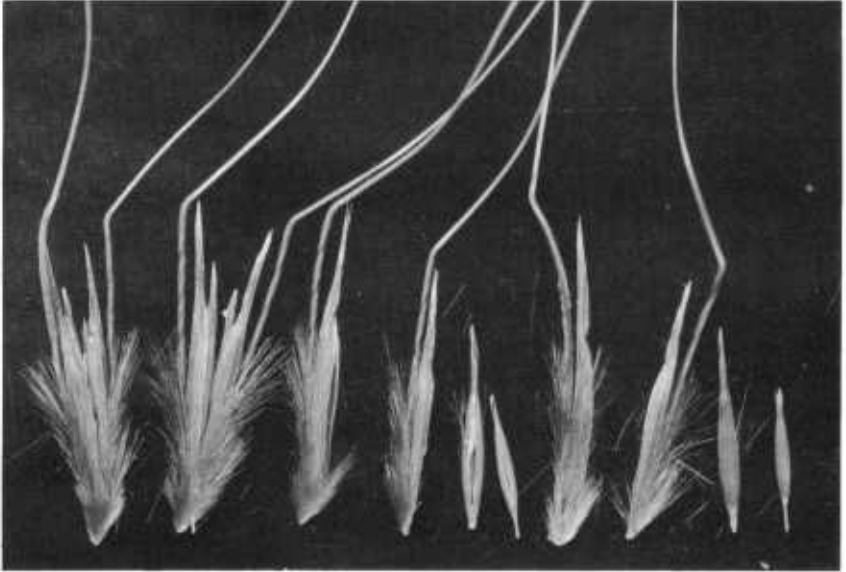
Avena sterilis L. var. *ludoviciana* (Durieu.)

A. ludoviciana (Durieu.) has long been considered as originating as a transition form in the descent from the wild or primitive, *A. sterilis macrocarpa*, to the cultivated species *A. byzantina* K. Koch (fig. 4). In general, *A. ludoviciana* is not so large either in plant or floret as *macrocarpa* and many morphologic characters in that supposed progenitor species are reduced or absent in *A. ludoviciana* and may be lacking entirely in *A. byzantina*, the supposed cultivated derivative of *A. sterilis*.

In general, plant, spikelet, and floret characters pronounced in *A. sterilis* are present, but much reduced in *A. ludoviciana*.

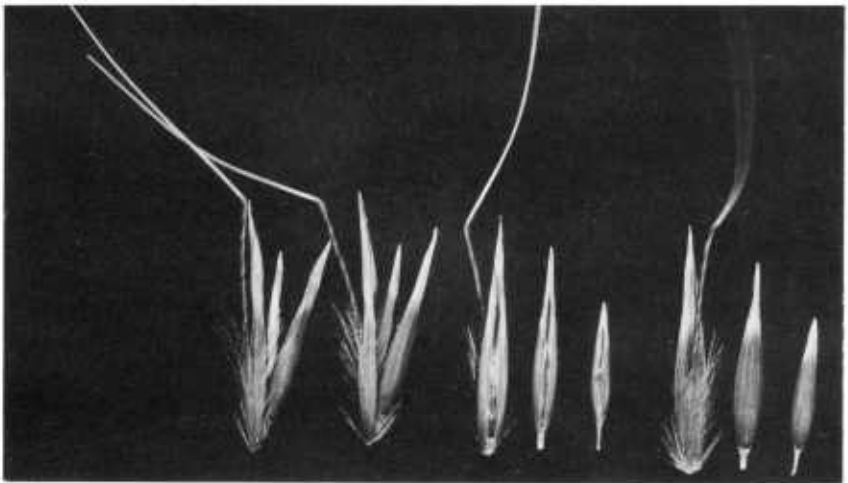
Juvenile growth erect to semierect, plants late maturing, short to midtall (125–140 cm); culms 2–4, mid-sized to slender, comparatively stiff, and lower portions not as decumbent at base as in *A. sterilis* L.; nodes usually glabrous or less pubescent than in *A. sterilis*; leaves wide, green, with margins usually only slightly or not ciliated on lower third; peduncle somewhat reduced and panicles sometimes not fully exserted; panicles equilateral, mid-long (20–28 cm) and midwide (8–12 cm); rachis usually slender, recurved at tip, with 6–8 whorls of 20–27 branches which are midlong, slender, raised to drooping in attitude; spikelets 25–40, with glumes 30–35 mm long, usually medium fine in texture,

reddish to reddish white in color; spikelets usually have 2-4 florets separating from peduncle by abscission, leaving much reduced and sometimes irregularly shaped basal scar, all florets remain solidly attached to primary floret in separation, and secondary and later



PN-4066

FIGURE 3.—Spikelets and florets of *Avena sterilis maxima*.



PN-4067

FIGURE 4.—Spikelets and florets of *Avena sterilis ludoviciana*.

florets are separated from the one below only by fracture; lemma 20–32 mm long, slender, red or grayish red, and moderately fine in texture; awn present on primary floret, 30–40 mm long, geniculate, and glabrous, awns on secondary florets may be much shorter, subgeniculate to straight, basal pubescence present but variable in extent and length on primary floret, usually numerous, midlong to long at base extending upwards to midpoint of lemma; pubescence present and less pronounced in second and still more reduced in third and later florets when such are present; rachilla segment of primary floret medium slender, pubescent to occasionally bearing comparatively few short (1–3 mm) hairs; nerves in lemma, usually 7, dark colored, and prominent.

***Avena sterilis* L. var. *intermedium* (Coffman)**

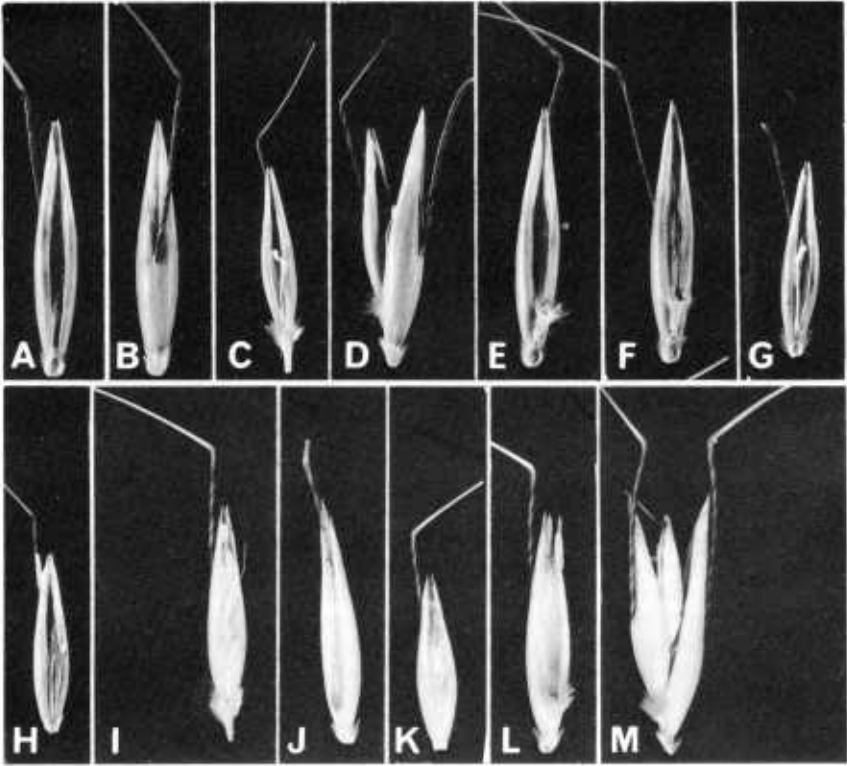
An intermediate variant in *Avena* has been observed to arise twice in 40 years by apparent mutation in cultivated oats. It appears to be a transitional form, morphologically, between *A. sterilis* and *A. fatua*. The nature of its occurrence has resembled that of the fatuoids, but this *Avena* differs decidedly in morphological characters from the fatuoids as well as from both *A. fatua* and *A. sterilis* (fig. 5).

In genetic studies of the inheritance of morphologic characters in *Avena*, Coffman (1964) found that when this variant was crossed with *A. sterilis*, it was recessive in many important morphologic characters, whereas when crossed with *A. fatua*, it was dominant in many fundamental morphologic characters.

In one cross of this *Avena* type with the *A. sativa* variety Black Mesdag, both *A. sterilis* and *A. fatua* (or fatuoid-type segregates) were observed among the more than 2,000 F₂ progeny product (Coffman 1964).

In the cross *A. fatua* × the variant, *A. sterilis*-type segregates appeared in a ratio of close to 1:63, or in a ratio of approximately 15 *A. fatua*: 48 intermediate aberrant types; 1 *A. sterilis* type. In still another cross with *A. fatua*, the *A. fatua* complex was recessive in a 1:3 ratio but no *A. sterilis*-type progeny resulted.

Juvenile growth semierect to erect (spring oat) with slight pubescence on leaves and leaf sheath, leaves midwide and dark green; adult plant midtall, erect growing; culms 3–5, slight or no pubescence at node, or leaf sheath or leaves; leaves medium dark green, raised in attitude, midwide; panicle equilateral, 10–20 cm long, branches 16–20, straight to raised; rachis slightly flexuous without false node; spikelets 20–30, florets 2–3, separation from pedicel by abscission; outer glumes 21–26 mm long, light reddish in color and medium fine in texture; lemma yellow, tinged with gray,



PN-4068

FIGURE 5.—Spikelets and florets of *Avena sterilis* var. *intermedium*: A to H, from Sixty-Day variety; I to M, from the Eaton variety.

18-20 mm long, medium wide, fine textured, 5-6 prominent nerves; awns present on first, second, and third floret, twisted and geniculate, midlong (3-6 cm), spikelet separation by abscission, floret separation by abscission, semiabscission, or sometimes by basal fracture; basal scar first floret and usually second floret, prominent, numerous midlong hairs at base of all florets, few to none on back of lemma; rachilla midstout, with numerous midlong hairs; palea yellowish to light red and gray tinged.

Avena fatua L.

The species is characterized by great diversity in many morphologic characters, especially in early growth, maturity, pubescence, culms, height, spikelets, and especially floret characters.

Taborda de Morais (1939) assembled and tabulated the different

names previously assigned by botanists to presumed variations in *A. fatua*. He lists 40 or more names. I have noted the great diversity of certain morphologic characters of *A. fatua* as found growing in different areas of the United States and believe that to key out and to describe each of these would prove too burdensome for this publication. Hence, I prefer to quote verbatim the reasonably concise description presented by Stanton (1955) rather than add still another lengthy botanical description of *A. fatua* to the literature:

Description.—Juvenile growth erect; plants early to midseason, midtall to tall (90–150 cm); culms small to midsized, stiff, glabrous; sheaths light green, usually glabrous; culm leaves midwide to wide, margins glabrous or ciliate on lower third; peduncles small to midsized, straight, usually fully exerted; panicles equilateral, very drooping, large, long, broad, ovate; rachises usually slightly flexuous, nodes 5 to 8; branches long, ascending or drooping from the middle downward, scabrous; spikelets few to numerous, 2- to 3-flowered, separating from pedicels by abscission, leaving distinct basal scars (suckermouths); florets separating by disarticulation of the second (and third) floret rachilla segments; glumes 20–26 mm long, 6 to 8 mm wide, usually 9-veined, light green and somewhat glaucous before maturity; grains slender to midplump; lemmas yellowish-white, gray, reddish-black, or black; first lemmas midlong to long (16–20 mm), usually laterally hairy; basal hairs numerous, short to long; awns numerous, dark colored on lower parts, twisted and geniculate, 25–40 mm long; caryopses 9 to 12 mm long; second lemmas 10–15 mm long; awns numerous, twisted and geniculate, 20–30 mm long; caryopses 6 to 9 mm long; second floret rachilla segments sparsely hairy or hairy (usually surrounded by a ring of hairs similar to that at the base of the lower floret or spikelets), midlong to long (2–3 mm).

As previously stated, the wild oat (*A. fatua*) is best differentiated by its long, twisted, and geniculate awns, hairy lemmas, and basal characters of the spikelets and florets (fig. 1). Great variability, especially in color and hairiness of lemmas, is found among the various collections of the wild oat. Sometimes intermediate, or transitional, forms are found between the wild and the common oat. One of these is *A. fatua* var. *glabarata*. However, it differs but little from the type species or variety. The lemmas of this form usually are less hairy and frequently the basal characters are less accentuated.

Presumably, the most important single morphologic character of *A. fatua* is that the primary and all secondary florets separate from their supporting rachilla segments by abscission, leaving attached at the base of the primary and all secondary florets the supporting rachilla segment of the floret next above. In this respect, *A. fatua* differs from all other hexaploid *Avena* species. (The fatuoid, however, has the same morphologic characteristic.)

***Avena byzantina* (Koch)**

The species is characterized by wide diversity in most morphologic characters. This was recognized by Koch (1848) who described and named the species that he considered to be derived from *A. sterilis*. Although Koch's paper was published in 1848, it did not become widely known in America until 1925.

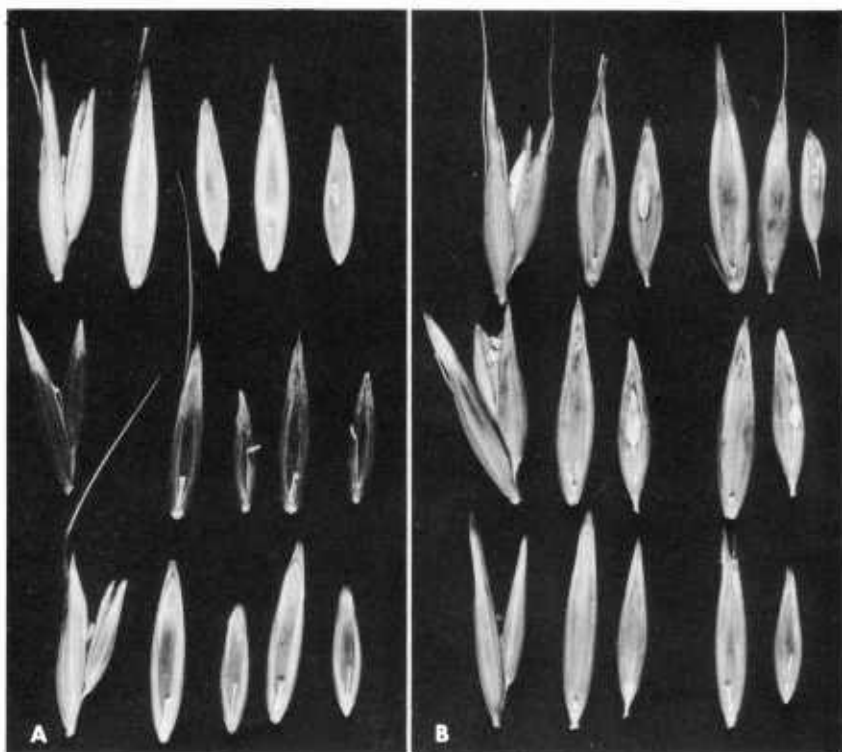
Coffman and others (1925) in studies of variability in the Burt oat referred to Koch's paper apparently for the first time in America and suggested that thereafter the cultivated derivatives of *A. sterilis* be classed as belonging to *A. byzantina*. For well over 40 years that suggestion has been generally accepted in the United States and other English-speaking countries.

The *A. byzantina* species is so extremely variable that to enumerate all the different morphological variations would require one almost to catalog the botanical characters recognized in *Avena*.

In only one recognizable morphologic character in *A. byzantina* are the varieties assigned to the species reasonably consistent. That is the mode of separation of the florets in the spikelet. Spikelet separation is by fracture and the two types resulting are: (1) Basifracture in which the supporting rachilla segment of the second (and third) florets must be more or less forcefully separated from the floret next below. On separation much of the segment usually remains attached to the floret it supports. (2) Separation is by more or less forceful fracture only, and such may occur at either the base of the supporting rachilla segment (basifracture) or irregularly breaking, tearing, or even partly splitting at any point between the base and the apex of the supporting rachilla segment (heterofracture).

If the separation takes place consistently by fracture at the apex of the supporting rachilla segment of the floret, the oat is usually assigned to *A. sativa* and not to *A. byzantina* (fig. 6). This is the primary morphologic character differentiating *A. byzantina* from *A. sativa* as indicated by Coffman (1946).

The difficulty in separating the cultivated oat varieties as belonging to *A. byzantina* or to *A. sativa*, by other than primarily on the basis of the area of separation of secondary and later florets from their supporting rachilla segments, is revealed by inspecting the some 100 pictures of spikelets and florets of different varieties as shown by Stanton (1955). He presented pictures of spikelets and florets of 29 varieties that he classed as belonging to *A. byzantina*. His pictures do not reveal that the second florets of three or four such varieties separate by basifracture as all varieties of *A. byzantina* are alleged to do.



PN-4069

FIGURE 6.—Spikelets and florets of two species of cultivated oats in the United States: *A*, *Avena sativa* L., *B*, *Avena byzantina* Koch.

More noteworthy, however, is the type of floret separation as shown by his picture of spikelets and florets of some 75 varieties of oats that he classed as belonging to *A. sativa*.

Among these some 75 varieties illustrated and considered to be classed as belonging to *A. sativa*, Stanton's pictures of some 10 to 15 of these reveal that the supporting rachilla segments of second and later florets, or both, to a greater or lesser extent, remained with the upper or floret detached in separation. In some pictures information was available as to the source of the variety illustrated, revealing that an *A. byzantina* parent to a cross was involved. In others, the parents were not known; the varieties being of obscure origin, but the evidence of presumed *A. byzantina* derivation or "parental influence" is unmistakably evident in several instances.

An interesting observation is that Richland differs from what would be expected from a derivative of Kherson supposedly be-

longing to *A. sativa*. However, reference to Coffman and Stanton (1925) discloses the evident variability existing in Kherson and the presence in the variety of individuals with morphologic characters presumably disclosing that they should be assigned to *A. byzantina* rather than to *A. sativa*.

To enumerate all the morphologic plant, spikelet, and floret characters of *A. byzantina* would be to catalog almost all those recognizable in cultivated oats. The one key morphologic character is considered to be the mode of separation of the secondary floret from the primary or the supporting floret. In separation, the rachilla segment of the upper floret remains attached in whole or in major part to the floret it supports.

***Avena sativa* L.**

The species was first described by Linnaeus (1753). He did not postulate as to its derivation from the wild species. Just who put forth the theory for the origin of *A. sativa* L. from the wild *A. fatua* L. is not known. That such a theory existed is revealed by reference to Haussknecht (1885) and Thellung (1912). They do not mention who first indicated such a theory for *A. sativa*'s derivation but both presumably accepted it.

However, Coffman (1946, 1961) was first in America to question such a derivation and he cites Lawson and Son (1852) and Hunter (1924) of England as doubting *A. sativa* was derived from *A. fatua*. However, neither Lawson and Son nor Hunter suggested any alternative for the origin of *A. sativa*, nor did either give the publication that first indicated the derivation with which they did not agree.

Coffman (1946, 1961) suggests that *A. sativa* was derived just as was *A. byzantina* from *A. sterilis*. Although this theory was challenged, support for it was published as indicated in papers by Griffiths and Johnston (1956) and Jones (1956).

The species *A. sativa* includes so many rather widely differing morphologic types that any description of the species as a whole is approximate at best.

In general, *A. sativa* is the most widely grown cultivated or economic oat. Varieties of the species differ widely but are in general those best adapted in the major oat-producing areas of the world. Such areas usually have comparatively cool summer climates. In North America, oats of this classification are most widely grown in the New England and Great Lakes areas, the upper Mississippi Valley, the northern plains sections, the intermountain valleys, and in Canada.

Although many varieties are rather upright growing and early in maturity, many are considered to approach, if not actually to be, midseason in maturity.

As a rule the plants are erect growing, have rather intermediate to stout culms, with slight to no pubescence above and below the nodes; leaves are midwide, usually dark green in color with little or no marginal ciliation; panicles usually are fully exserted, and large, nodes 7-9, and with stout, somewhat flexuous rachis, usually midlong, midstout branches; straight to raised in attitude; spikelets are numerous, usually 2-flowered although a third floret may be present in most spikelets of some varieties; outer glumes, usually 20-24 mm long, generally but by no means all have light-colored lemmas of medium-fine texture; floret characters vary with variety, usually 17-22 mm in length, usually with little or no basal scar nor basal pubescence, although a few medium to long basal hairs may be observed at the base of some lemmas; separation of florets is by fracture, usually at or near the apex of the rather stout, flattened, usually nonpubescent, supporting rachilla segment; lemmas 17-20 mm long, usually of light color (yellow or white) although gray- and even black-kerneled oats exist, usually wide to midwide, lemmas usually are of fine texture with 7-9 obscure nerves; awns, when present, usually are found only on the lower floret, often are comparatively short, straight, (weak) but may be twisted and geniculate, although more often subgeniculate or even straight; rachilla segments usually are nonpubescent, midlong, and midwide and floret separation is by fracture, usually distal, but frequently by heterofracture in a few spikelets of the same panicle.

In general, the morphologic characters of *A. sativa* differ from those in *A. byzantina* primarily in having fewer "wildlike" characters (*A. sterilis*-like) and indicate clearly the improvement resulting from the efforts of oat breeders over the past centuries.

***Avena sativa* L. ssp. *orientalis* (Schreb.)**

In general, varieties assigned to this morphologic classification are characterized by so-called unilateral or "side" panicles as contrasted with the equilateral (spreading) panicle which is, by far, the most common in both wild and cultivated *Avena* (fig. 7). As indicated by Coffman (1961), who quotes Besspalov's translation of Zade (1918) on the history of side oats as follows:

Side oats found their way into Germany probably from the east. The first literary information about the discovery of side oats in Germany

dates to 1721. In this year it is said side oats were found near Halle in Thuringia. The local names were Turkish oats, Russian oats, Tartarian oats, or Hungarian oats.

Records of the Department's Agricultural Research Service (ARS) reveal that in the accession (C.I.) list the first oat accessioned, presumably in 1895, was "C.I. No. 1: White Tartar." Today, this variety is about the most widely known side oat in America. It also is known as "White Russian," the two being considered synonymous. Through 1972, 9,193 oats were accessioned by ARS.

Apparently, to date no varieties of side oats are sufficiently winter hardy to be fall sown in America. All such have been and still are spring-sown oats. The primary morphologic characters differentiating *A. sativa* ssp. *orientalis* from other species and varieties of hexaploid ($n=21$) *Avena* are the shape of the panicle and the presence of the so-called "false node" at the base of the rachis in many, if not most, panicles of some side oats. The form of the panicle is largely determined by the attitude or position of the panicle branches. In the side or unilateral panicle, the panicle branches supporting the spikelets very definitely tend to extend upward, more or less, parallel to the rachis although they usually are inclined to droop decidedly away from the upright rachis at their outer ends.

In all well-known varieties of *A. sativa* ssp. *orientalis*, the spikelets are usually 2-flowered although in some, 3-flowered spikelets may be present. No unusual morphologic spikelet nor floret characters are apparently specific to *A. sativa* ssp. *orientalis*. The one primary differentiating morphologic characteristic for *A. sativa* L. ssp. *orientalis* is the panicle shape.

***Avena nuda* L.**

The primary distinguishing morphologic character of *A. nuda* or the so-called hull-less oat is the fact that at maturity the protective lemma and palea of the floret, although present, do not adhere to the caryopsis or groat (kernel) which they have enclosed during the early stages of development and growth. Consequently, at maturity in threshing, the kernel (groat) usually is released entirely from its protective lemma and palea.

A second distinguishing morphologic character is the fact that especially the upper spikelets frequently are multiflorous, often having from 4-8 or even more florets to the spikelet, whereas in covered oats only two, and usually not over three, fully developed florets are present (fig. 8).

A marked morphologic characteristic in *A. nuda* is the unusual length of the rather slender supporting rachilla segment of each floret, and often stiff, usually fine texture of the parchmentlike lemma and palea. The lemma and palea, depending on the variety,

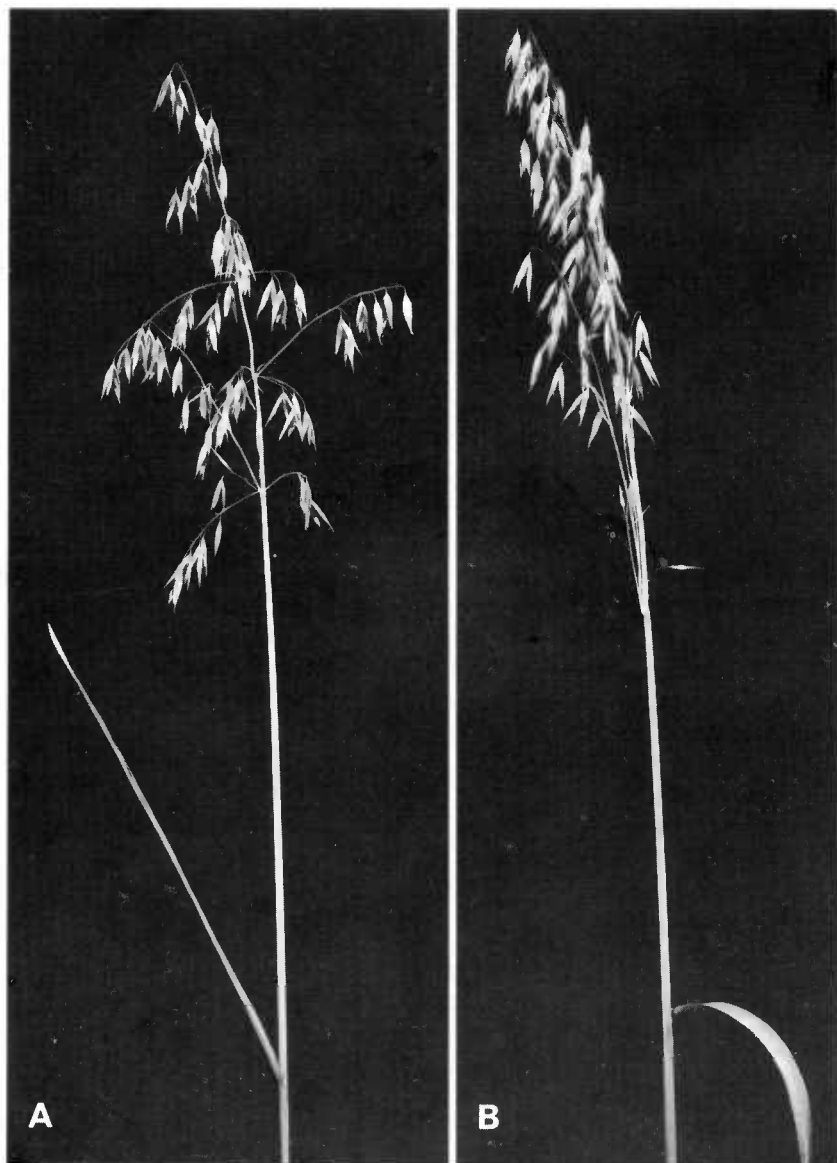
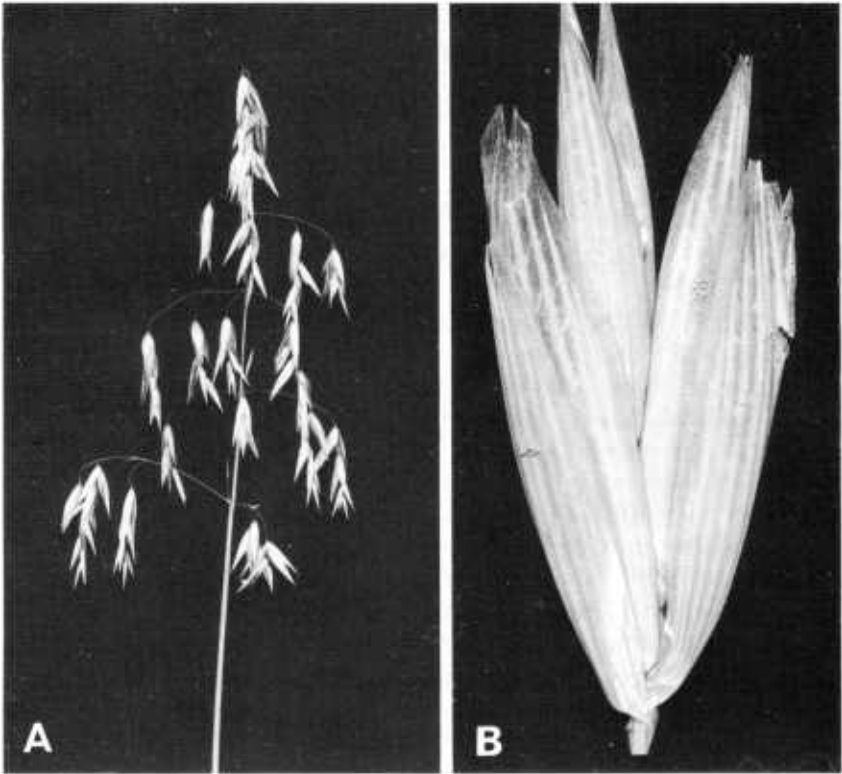


FIGURE 7.—Panicle types in *Avena*: A, Spreading; B, side panicle.

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FIGURE 8.—Panicle (A) and spikelets (B) of *Avena nuda*.

may be somewhat streaked with darker tissue or may lack pigmentation (color); lemmas may or may not be awned, differing in number, length, and type from twisted geniculate, subgeniculate, to straight depending on the variety. The base of the lemma is somewhat enlarged and pubescent in some varieties, but not in others.

In the multiflorous condition of the upper spikelets in *A. nuda* at least one “covered” oat variety of *A. byzantina*, Cimarron, C.I. 5106, has been observed under some climatic conditions to produce multiflorous but not hull-less spikelets in the upper two or three spikelets in the panicle.

A. nuda L. and similar aberrant multiflorous types are considered recessive variant types, arising infrequently in covered *Avena*. Such was reported by Coffman and Quisenberry (1923) in the Burt variety and by Coffman (1964) as segregates in the two

resulting hybrid populations of oat crosses; Red Rustproof (*A. byzantina*) × Cole (*A. sativa*) and Calcutta (*A. byzantina*) × Kherson (*A. sativa*).

AVENA STERILIS, PROGENITOR TYPE OF HEXAPLOIDS

In 1946, Coffman (1946) published his theory of the derivation of all hexaploid oats from *A. sterilis*. He also reported supporting information from other than the purely morphologic fields. In 1954, Sampson (1954) published his paper on the origin of oat species, which takes exception to Coffman's theory. Shortly thereafter, Griffiths and Johnston (1956) irradiated *A. sterilis* and obtained *Avena fatua*-like oats. They and Jones (1956) considered this as evidence supporting the theory of origin of all hexaploid oats as derived from *A. sterilis*. Additional information on this theory followed (Coffman 1961).

The following facts supporting this idea are:

(1) *A. sterilis*, *A. fatua*, *A. byzantina*, *A. sativa*, and *A. nuda* are all hexaploids. A high degree of compatibility exists in chromosomes between any two of them pairing in hybrids (Nishiyama 1939).

(2) *A. sterilis* was irradiated and *A. fatua*-like segregates obtained among resulting progenies (Griffiths and Johnston 1956).

(3) Numerous reports of *A. fatua*-like mutational aberrant fatuoid forms appearing among populations of cultivated oats have been received.

(4) Many aberrants of fatuoid type, as described by Coffman and Wiebe (1926), have been found in *A. byzantina* oats, universally considered today as derivatives of *A. sterilis*.

(5) A significant finding is that among all hexaploid oats, spikelet separation entirely by abscission is found in only two—*A. fatua* and these fatuoid aberrants.

(6) Except for the fatuoid complex, fatuoids are recognized as having most of the characters of the progenitor type and the aberrants arising from a wild oat would be expected to have wildlike characters, such as dormancy. Many *A. fatua* oats have a high degree of dormancy.

(7) Several crosses of *A. sterilis* with other hexaploid oats have been studied genetically. In all cases so far reported, the *A. sterilis* complex has been dominant in F₁ to the other morphologic type with which it was crossed. In no case has the *A. sterilis* character-

complex appeared less frequently among F_2 progenies than the character-complex representative of the other parent to the cross.

(8) All species of hexaploid oats are found growing together in the wild or primitive state in certain rather isolated areas of Asia Minor (Vavilov 1926).

A second point of controversy is with regard to the origin of *A. sativa*. Who first proposed the theory is not known, but it was widely quoted and apparently accepted, with only a few to question it, for more than a century. Apparently, Lawson and Son (1852) were the first to challenge it. However, they did not present any other theory to explain their disbelief. In 1946, Coffman (1946) challenged this theory. He indicated that all hexaploid oats, both wild and cultivated, were derived from the one species *A. sterilis*. His challenge brought some adverse response and was questioned by Sampson (1954) and others.

The facts offered as evidence that all *A. sativa* oats trace to one species, *A. byzantina*, are as follows:

(1) The cytologic evidence is that *A. sterilis*, *A. fatua*, *A. sativa*, *A. byzantina*, *A. nuda*, and *A. orientalis* have $21n$ chromosomes.

(2) The florets of *A. sativa* do not separate by abscission as was so long implied, if not actually stated, by many scientists. Floret separation in both the cultivated species *A. sativa* and *A. byzantina* is actually by fracture. This fact was pointed out by Coffman (1946) and was supported by Musil (1946). In *A. byzantina* the fracture is largely confined to the basal portion of the connecting rachilla segment, whereas in *A. sativa* the fracture usually takes place in the distal portion of the rachilla segment. However, in many varieties, especially those that have been assigned to *A. sativa*, the fracture in the spikelets may occur at points between the basal and distal areas (Stanton 1955, illustrations).

(3) The occurrence of *A. sativa*-like individuals among progenies of *A. byzantina* oats was observed and reported over 90 years ago by Haussknecht (1885), was clarified by Thellung (1912) and was indicated by Schulz (1913a,b) and by Coffman (1946).

(4) In F_1 crosses between *A. byzantina* and *A. sativa* oats, the *A. byzantina* (fracture-basal) type was dominant; and in four crosses studied, *A. sativa* (fracture-distal) appeared recessive in all (Coffman 1961).

(5) In all reports received to date, floret separation by abscission (*A. fatua*) is recessive to floret separation by fracture, whether basal or distal (Jensen 1961).

(6) Further supporting evidence for the theory that *A. sativa* was derived from *A. byzantina* is obtained from the study of plant pathology. Evidence exists that more *A. byzantina*-type than *A.*

sativa-type oats have resistance to one or more of the different disease organisms that attack oats.

It long has been recognized that genes for resistance to crown rust, stem rust, loose smut, covered smut, halo blight, *Helminthosporium avenae*, and *H. victoriae* and, more recently, genes with tolerance to barley yellow dwarf virus and soilborne mosaic are found most frequently in oats classified morphologically as being of the *A. byzantina* type.

(7) Study of the physiologic factors in oats supplies additional evidence as to the origin of *A. sativa* from *A. byzantina*. The physiologic factors for dormancy, resistance to cold, resistance to heat, and the cool temperature requirement for normal development in oats are all found in *A. byzantina* varieties. When found in *A. sativa* varieties, they are either known or are suspected of being *A. byzantina* derivatives.

(8) Multiflorous cultivated naked oat, *A. nuda*, is a recessive aberrant frequently observed among progenies of crosses between covered oats. It has been observed among progenies of crosses between varieties classified as *A. sativa*, *A. byzantina*, and in crosses between varieties of each parent type. Morphologically, *A. nuda* is as distinct for its typical characters as are fatuoids for their "wildlike" characters. As a consequence, it must be assigned a separate place in oat descriptions and classifications. However, it is believed that Linnaeus (1753) who ranked *A. nuda* as a species, accorded this oat form too much importance and that, since it is a cultivated oat, *A. nuda* should be considered not as a *species* but as a subspecies of cultivated oats [*A. sativa*].

The present morphologic classification of hexaploid oats is based on this background information about the origin, derivation, and relationship of the different hexaploid species of oats.

THE OAT PLANT

The oat plant is an annual cereal grass. The major botanical divisions of the plant are roots, culm, leaves, panicle, spikelet, and florets. In this publication these primary plant parts are subdivided.

The general characters of the oat plant are discussed first, followed by a more detailed description of the strictly taxonomic characters of the different plant parts.

The oat plant develops from an embryo in which the scutellum, coleoptile, two foliage leaves, and the seminal root system are differentiated. The successive developmental stages of the oat plant have been described in detail by Bonnett (1961).

The life of the oat plant is divided into two general phases. The period from the time the seed germinated until the panicle emerges from its protective "boot" leaf sheath is usually considered the juvenile stage. The period from the time the panicle emerges through maturity is the adult stage.

Morphologic Characters

The most complete coverage of the strictly botanical characters of the oat plant up to 1916 was made by Etheridge (1916). He included 28 separate plant characters in his descriptions. Archer (1922) and De Villiers and Sim (1936) followed Etheridge in general, but disregarded many characters described by Etheridge. De Villiers and Sim described only 15 characters and Archer only 11.

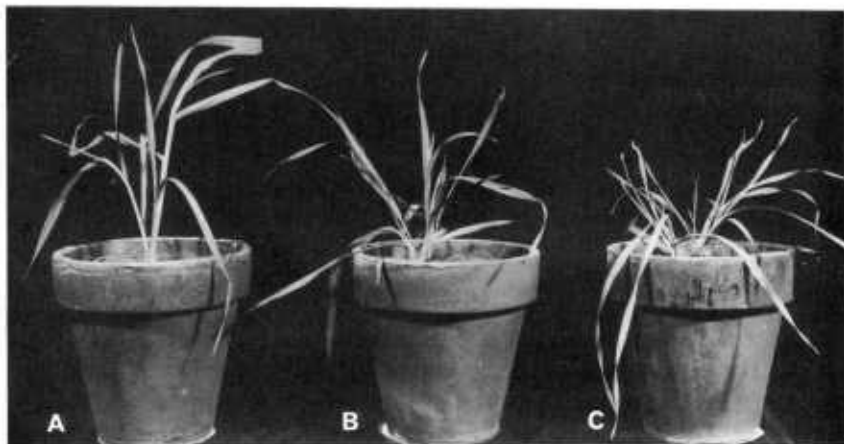
Marquand (1922) did not follow Etheridge in his classification of oats. His system is less easily understood but he included most of the characters described by Etheridge.

Stanton (1955), however, not only followed the system of Etheridge closely and included descriptions of all but two of the 28 characters described by Etheridge ("double kernels" and physical property of the outer glumes), but also described some 10 additional characters either disregarded or used in only a general way by Etheridge. Hence, Stanton's classification and discussion of the morphologic characters of the oat plant is by far the most complete one available in the English language up to this time. Stanton described 36 characters.

In this publication nearly all the characters included by Stanton as well as several additional ones are discussed.

Juvenile Growth Type

In general, three distinct types of juvenile, or early plant growth habits, have been recognized: Prostrate (turflike), semiprostrate, and erect or upright (fig. 9). These types are essentially the same three recognized by Etheridge (1916), Stanton (1955), and others. The prostrate or decumbent growth type is associated with winter resistance in oats, just as the most upright early growth is associated with spring oats. Within certain temperature and age limits, the lower the temperature the more decumbent or prostrate the growth habit. This is especially true of plants usually described as semiprostrate. A strong relationship also exists between the most decumbent growth type and late maturity. The most decumbent type ordinarily does not respond so quickly to a



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FIGURE 9.—Juvenile plant growth habit in oats: A, Erect; B, semiprostrate; C, prostrate.

rise in temperature, as do the other types. This characteristic in winter oats is associated with tolerance to cold temperatures.

From the time of culm formation very early in the plants development until the time of "shooting" (or period of most rapid culm elongation), the culms of most winter oats remain semiprostrate or do not deviate from the soil surface by an angle greater than 45° . The angle of semiprostrate oats will be greater than 45° , and that of upright oats may approach 90° .

At maturity, all culms appear upright. But examination of the crown will reveal that the more prostrate culms bend near the soil surface.

Winter Hardiness

Winter hardiness is determined by a complex of characters that enables the plant to survive the rigors of winter. Neither the exact factors involved nor the nature of their operation is fully understood. Resistance to low temperatures is the primary factor involved. Other factors, alone or in combination, that influence winter survival are heaving resulting from alternating temperatures, unfavorable moisture conditions, smothering, diseases, and desiccation resulting from high winds. These factors are usually physiologic and, as indicated by Wiebe and Reid (1961), one factor that enables a plant to survive one year may not be important or may be less important another year.

Tillering

The ability of a plant to produce additional culms or to tiller is useful in differentiating winter from spring oats. However, a complete range in tillering exists; and conditions as to growing space, climate, light, and fertility, greatly influence the number of tillers per plant. In general, winter oats tiller more profusely than do spring oats. If temperatures are relatively high, the culms tend to increase in height at the expense of numbers.

Adult Plant Characters

The height of the plant is a highly variable and at best only a relative morphologic character. Height is especially influenced by the factor of day length or the length of the light period. Day length has a profound influence on oat plants, especially during the jointing stage. An overlong day length at that period reduces plant height; a shortened period increases height. During the seasonal peak light period in some areas, daylight starting by 4:00 a.m. may continue until about 9:00 p.m. for 17 hours per day. Oats reaching their most critical period of culm elongation during these long days tend to be shorter than those varieties that have passed through their critical stage of development earlier or those that attain that stage later in the season.

Regardless of the inconsistent nature of this character, plant height is useful for general descriptive purposes in the classification of oats; unusually tall oats tend to be relatively tall and extremely short oats relatively short under the same set of conditions. If oats are grown under different conditions, the character is of uncertain value in differentiating among varieties within a group.

Standing Ability

Strength of straw or standing ability depends on more than the culm itself. Straw that will withstand pressure from the wind, especially winds accompanying rain storms, during the fruiting period is classed as strong. That which lodges or breaks over under similar conditions is termed weak. Hamilton (1951) showed that the number and attachment of the roots, as well as the structure of the culms, greatly influenced standing ability. One characteristic in the stem itself profoundly influences standing ability; the ability of the ripened culm to withstand breaking in the later growth and maturity stages. Some varieties are notably lacking in this character and break over or "crinkle."

Time of Maturity

The time of maturity in oats is a useful character in their morphologic classification. Types of maturity or ripening used in this study included very early, early, midseason, late, and very late. This grouping was also used by Stanton (1955). Most American oat varieties are classed as belonging to one of the three groups: Early, midseason or late.

When oats are planted under conditions for normal development of the plants, no difficulty is experienced in making the separations. But under unfavorable or adverse conditions, difficulty results. This is especially true of some winter oats when they are spring sown.

Environmental factors, such as temperature, light, and moisture, profoundly influence time of maturity in oats. Indications are that many oats have a cool weather requirement that must be satisfied before oats will head.

In general, this requirement is much longer in the decumbent-growing winter oats than in the upright-growing spring oats. The influence of this requirement is especially noted in oats of the Red Rustproof type, and in the variety Dubois, when spring sown at Aberdeen, Idaho. Such oats when sown in the spring will head and produce a crop in Idaho. However, they must be sown early; otherwise, they continue to vegetate and heading is delayed until late in the season, endangering maturity by the onset of cold weather.

As stated by Stanton (1955):

Time of seeding greatly influences the time of maturity of varieties on the basis of time of ripening. Early, midseason, and late spring varieties when sown in early May at Aberdeen, Idaho, usually fail to show marked variation in time of ripening. When sown 3 weeks earlier, which apparently represents the optimum date of seeding, satisfactory differentiation for maturity is shown.

To study the relative maturity of the more truly winter-type oats, fall seedings were made and records kept in Virginia and Maryland, as well as in Aberdeen, Idaho.

Roots

The oat plant has two types of roots, seminal and adventitious. Seminal roots originate during embryo development and consist of a jointed primary root (radical) and branches arising at the first node or joint. Adventitious roots arise at the nodes of the stem and tillers at joints just beneath the surface of the soil. Contrary to a

formerly widely held idea, depth of seeding appears of little importance in determining depth of main coronal roots.

No classification as yet has included the root systems of the oat plant as a character of major importance in the classification of oats. Root characters were not included in this study. However, roots differ, especially as to number. In the later maturing winter oats, they are more numerous than in spring oats. They apparently are most numerous in those late-maturing winter oats that have a distinct prostrate type of early growth and usually much less numerous in early maturing upright-growing spring oats. Hamilton (1951) made a detailed study of the root system of the oat plant.

Culm

The stem or culm is comprised of a series of nodes (joints) and internodes. The nodes are solid, whereas the elongated internodes, at first solid, become hollow as the parenchyma or pith cells break down just before and during maturation.

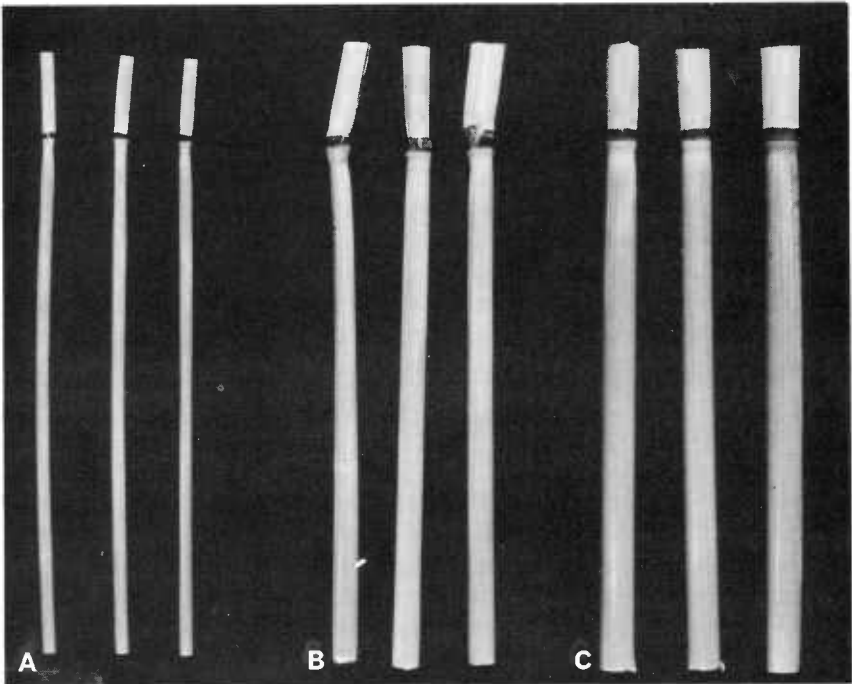
The culm and peduncle (the uppermost culm node and internode) may differ as to size, color, and presence of pubescence. Three stem sizes (diameter) are recognized, small (fine), midsized, and large (stout) (fig. 10). These characters are greatly influenced by growing conditions. However, they are of decided morphologic value for descriptive purposes (fig. 10).

The color of the mature culm is of limited use for descriptive purposes. In general, oat stems may be yellow or red. Stem color in cultivated oats may or may not be developed, depending on the conditions under which the plants are produced. As indicated by Stanton (1955) the straw of common oats is, with few exceptions, yellow and has little pigmentation, whereas that of varieties such as the Red Rustproof type may develop a decidedly red color under some seasonal conditions (plate 1).

Profuse hairs at the nodes is a reliable character in the classification of oats. Especially in varieties that have a profuse collar of hairs above, below, or above and below the node (fig. 11). In numerous varieties the number is variable, or only a few hairs are present. In such, the character is of slight value.

Leaves

The leaves of the oat plant are solitary and are formed acropetally at a point opposite the insertion of the preceding leaf. They are two-ranked (distichous) and sessile (Bonnett 1961). The leaf



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FIGURE 10.—Culm (stem) size in oats: A, Small (fine); B, midsized; C, large (stout).

consists of the sheath, blade, and a membranous appendage, the ligule (fig. 12).

The leaf sheath is an open cylinder. In young plants, the leaf sheath of the older leaf encloses the stem and younger leaves (Bonnett 1961). At maturity, each leaf sheath encloses all or part of the elongated internode next above the node at which it is attached, and the leaf sheath tends to add strength to the culm. Leaf sheaths may differ as to length, presence or absence of a ligule, and pubescence.

Etheridge (1916) indicated that, with respect to length, two classes of leaf sheaths are observed. The difference was correlated with the presence or absence of the ligule.

The leaf blade is elongated, flat, narrow, and linear. The margin of the leaf blade is entire and the tip is acute. The leaf margin may be ciliate, especially the lower portion; or ciliation may be absent. The junction of the leaf blade and sheath is sometimes called the collar. At this point, the leaf blade is narrow with margins



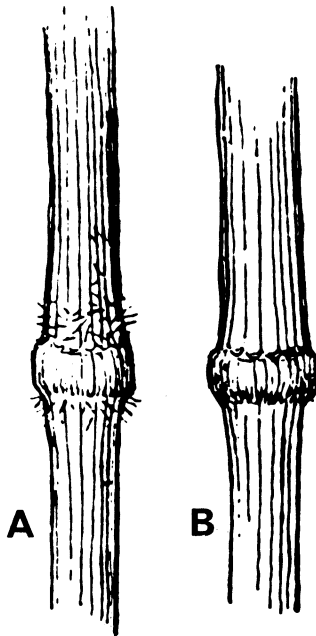
PLATE 1.—The two stem colors found in oats: A, Yellow; B, red. (Natural size.)

incurved around the stem and overlapping to form a cuplike depression (Bonnett 1961).

The blade is characterized by its width, attitude, pubescence, and, in some varieties, color. The width is subject to climatologic influences and for that reason is often of minor value for classification. Some varieties of oats, however, have extremely wide leaves under any conditions. Others have unusually narrow leaves regardless of environmental conditions. These extremes are useful in varietal descriptions. However, most varieties have midwide leaves, which are of no value in classification.

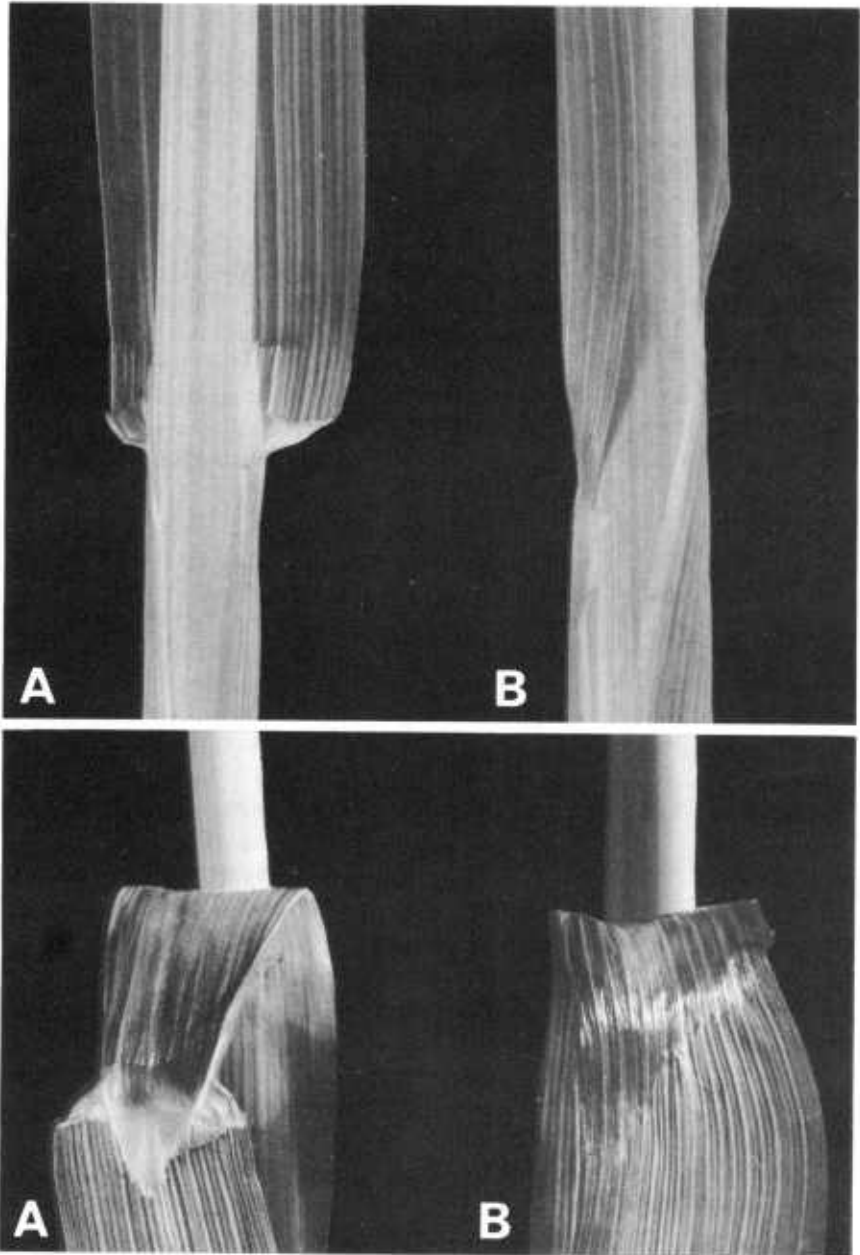
The somewhat rigid or upright attitude of the upper or "flag" leaf is useful in classification because the adhering leaf sheath adds strength to the culm. An example of such a variety is Clinton.

With few exceptions, oat leaves have ligules but they do not have auricles. The ligule is a thin, membranous appendage that is continuous with the inner margin at the juncture of blade and sheath. The ligule extends upward, clasping the stem (Bonnett 1961).



PN-4074

FIGURE 11.—Hairiness of culm internodes of oats: *A*, Pubescent (hairy), *B*, glabrous (nonhairy).



PN-4075

FIGURE 12.—Top, *A*, Liguled oat, *B*, liguleless oat. Top view shows natural position of leaf blades of (*A*) liguled and (*B*) liguleless oats; bottom view, leaf blades partially removed from culm for (*A*) and (*B*).

As Stanton (1955) has indicated, at the juncture of sheath and blade, a scarious, cartilaginous, membranous, fringed or tooth-edged appendage called the ligule is present and serves to hold the leaf and leaf sheath tightly to the culm.

At the juncture of blade and sheath, a distinct, thickened separation area is present; and the blade does not touch the culm above that point. Only a few oat varieties (termed "side oats") lack the ligule, and all are classified as belonging to *A. sativa* ssp. *orientalis*. Etheridge (1916) indicated that in the absence of the ligule the leaf is continuous with the sheath and its characteristic form is easily recognized. The ordinary leaf bends away from the culm at its juncture with the sheath. The leaf of liguleless oats extends upward parallel to the stem for some distance and tends to clasp the stem. The ligule is useful in oat classification.

The pubescence of the leaf usually is confined to the margins of the lower part of the blade. Some pubescence may, however, also appear on both the upper and lower surface of leaves of juvenile plants of such varieties as Nysel. Leaf margins of juvenile plants may be profusely pubescent, just as are the leaf sheaths in the same plants. A high correlation between the pubescence of these two portions of the leaf is useful in the identification of varieties.

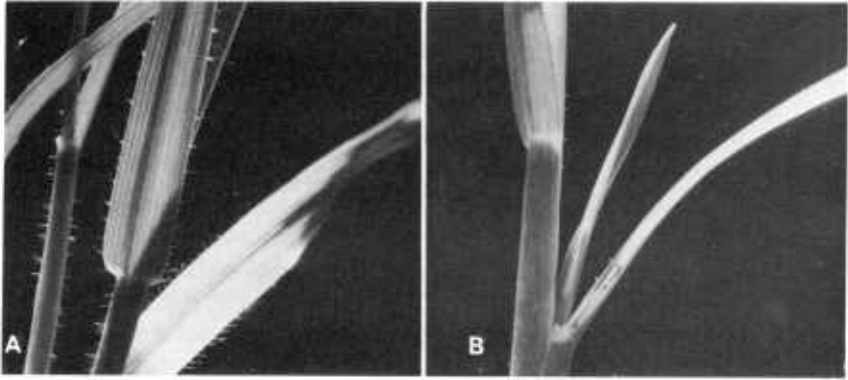
The leaf sheaths of many oat varieties, especially those of the lower leaves in juvenile plants, may be decidedly pubescent. Also, more or less pubescence may be present on the upper sheaths of upper leaves. Pubescence on leaf sheaths appears most obvious on the juvenile plants of our most winter-hardy varieties (fig. 13).

The color of the leaf may be especially helpful in varietal identification of green plants. Certain varieties such as Mo. 0-205, have a distinctly light or yellowish-green color. Others such as Navarro, may have a glaucous or what appears to be a bluish-green color.

Panicle

The inflorescence of the oat is termed a panicle. The main axis of the panicle (the rachis) is a continuation of the stem, terminating in a single pediculate spikelet.

The length and width of panicles may differ greatly. Some varieties have an exceptionally long rachis and panicle, whereas others have notably short ones. The difference in length results largely from length of internodes of the rachis. Although environmental influences tend to affect panicle length, the relative length of the panicle is a useful character in classification of oats. The width of the panicle is determined by the length and the attitude



PN-4076

FIGURE 13.—Pubescence of sheaths and leaf margins of oats: *A*, Hairy sheaths and ciliate leaf margins; *B*, glabrous (nonhairy) sheaths and leaf margins—only a few hairs are evident ($\times 2/3$).

of the lateral branches. The length of the branches largely determines the panicle size and shape.

The shapes of oat panicles are of two general types. In general, panicles are classed broadly as either “equilateral” or “unilateral,” but in actuality transitional divergencies from each are numerous and defy employment of botanical terminology adequate to differentiate them fully.

The equilateral panicle is by far the more common. Relatively few varieties have unilateral or side panicles. The shape of the panicle is determined primarily by the length, attitude, and number of the rachis branches.

The position of the branches on the rachis and their attitude influence the panicle shape. The branches may be classed as ascending, spreading, or drooping in equilateral panicle types and as pectinate or confused in the unilateral panicle (fig. 7). In length, panicle branches of different varieties differ greatly. Long, drooping panicle branches or short, stiff, somewhat ascending branches are useful in variety descriptions.

Rachis and Branches

The rachis, or main axis of the panicle, is a continuation of the stem or culm running through the panicle. Like the culm, it consists of a system of nodes and internodes.

Solitary, alternate, two-ranked, lateral branches arise at the nodes or joints of the main axis. The second branch is initiated at

the side of the rachis opposite the first branch or the branches arising at the node. Those of higher order are initiated successively according to this pattern. First-order branches in turn give rise to second-order branches, and so on, forming a system of branches of different order, each terminating in a single pediculate spikelet (MacKey 1959, Bonnett 1961).

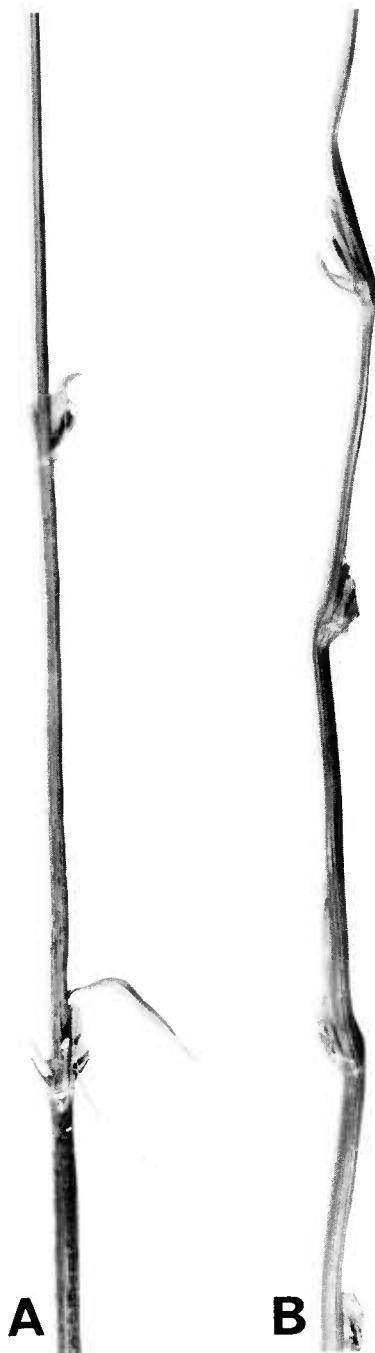
The panicle axis or rachis is usually characterized as somewhat flexuous (twisted). Varieties differ in this characteristic and in a few the rachis appears straight. The number of panicle nodes may differ somewhat with variety. There is no genetic correlation between length of rachis and culm height according to Rudolf, cited by MacKey (1959). In general, however, the number of nodes is a relatively constant character in the oat panicle of any variety. Differences in number of nodes are influenced less by the environment than are the differences in number of lateral branches that develop, or differences in the length of the internode.

Etheridge (1916) pointed out observable differences in the structure of the first or lower node of the rachis and the whorl of branches that arise from it. In several varieties, especially those with unilateral panicles, the lower whorl arises at a geniculate bend at the second rachis node rather than at the first node. This unusual development was also mentioned by Marquand (1922), who characterized it as a "false node." The presence of the false node is useful in characterizing some oat varieties, although Marquand (1922) and Stanton (1955) both indicated it was somewhat of an abnormality (fig. 14).

Spikelet

The oat spikelet consists of two empty glumes (bracts) attached to the terminal pediculate node of the rachis axis, branch, or subbranch. The glumes partially enclose but do not clasp the primary and secondary florets of the spikelet. Solitary, alternate florets arise at the subsequent nodes or joints of the zigzag rachilla. Each floret supports the rachilla segment of the floret next above. Usually only the first and second florets are fertile, although in a few varieties three florets may regularly produce viable seeds. The wild oat *A. sterilis* may produce as many as four fertile florets when optimum growth conditions exist.

In multiflorous (naked) oats, solitary alternate florets arise at the rachilla nodes or joints just as in covered oats. The difference is that each rachilla segment is much more elongated. As many as eight fertile florets may be produced in a single spikelet, and three to six are usual.



PN-4077

FIGURE 14.—Rachis types in *Avena*: *A*, Straight; *B*, flexuous.

Floret

The floret is composed of the lemma, the palea, and the organs of reproduction; namely, the ovary with its bifid style, the plumose stigma, and the three stamens.

The lemma or flowering glume is the lower of the two bracts or scales that form the envelope of the kernel. It is slightly shorter and much firmer in texture than the empty glume. It is ovate-lanceolate or boat shaped, with the scabrous apex bifid or entire. The veins of the lemma and glume appear as slender, riblike striations. In some wild forms the veins of the lemma extend beyond its apex as teeth or awn points and are used as characters in distinguishing species (*A. strigosa*). The number of nerves is variable, usually ranging from 7 to 11 in cultivated varieties. The base of the lemma may be extended into a swollen callosity, commonly called the callus (fig. 15).

The dorsal surface of the lemma may be either hairy or glabrous, characteristics much used in identifying oat species. Most wild species of oats are characterized by hairiness of the callus, lemma, and rachilla. The callus, a somewhat swollen, thickened, and hardened projection at the base of the lemma, often bears more or less conspicuous bristles, usually termed basal hairs. The presence of these hairs may be observed readily without magnification (fig. 16). Coffman and others (1925) describe the oat spikelet as follows:

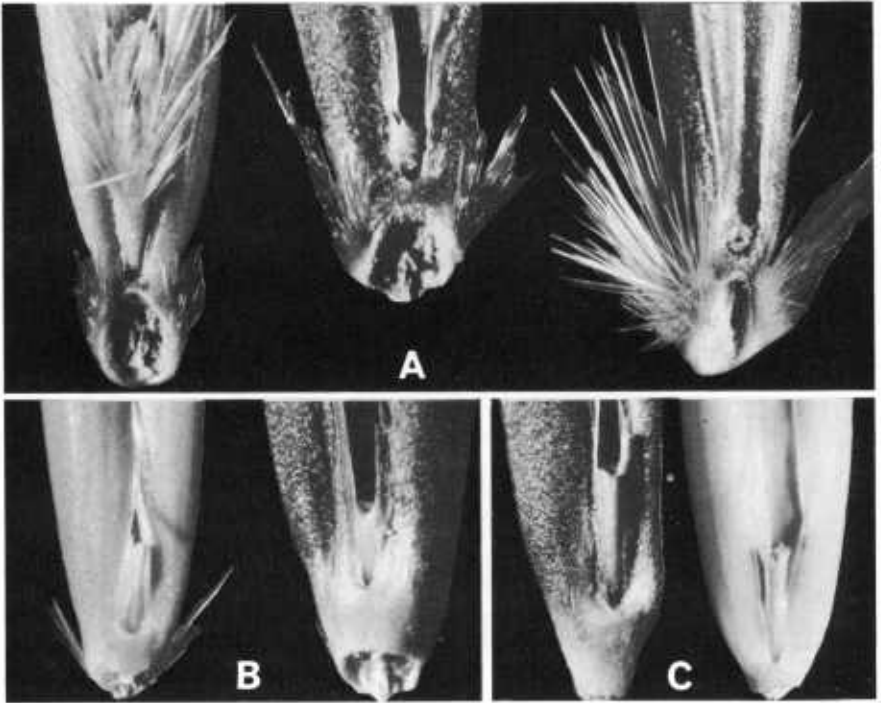
The spikelet is borne on the thickened end of the slender, drooping pedicel which terminates the panicle branch. Each spikelet usually contains two or more florets, though one-flowered spikelets occur rarely. No oat varieties are known which produce one, two, or three florets per spikelet, exclusively. The lower two florets usually are perfect, while the third, if present, often is staminate or imperfect. The first floret is the largest and contains the larger kernel or caryopsis.

The two lower glumes, or empty glumes, are somewhat unequal, lanceolate, acute, boat shaped, spreading, glabrous, membranous, and usually persistent. Both usually exceed the lemma or flowering glume in length, except in naked oats.

The rachilla or axis of the spikelet bears all of the florets and connects the spikelet with its supporting pedicel. In some species, such as *A. nuda* and *A. strigosa*, the rachilla segments are elongated and narrowly clavate; while in other species, such as *A. sterilis*, *A. fatua*, and many of their cultivated derivatives, the segments usually are shorter and more thickened.

Zade (1918) stated that the greatest difference between wild and cultivated oat species is their method of separation from the pedicel.

The empty glumes or bracts in the early stages of growth

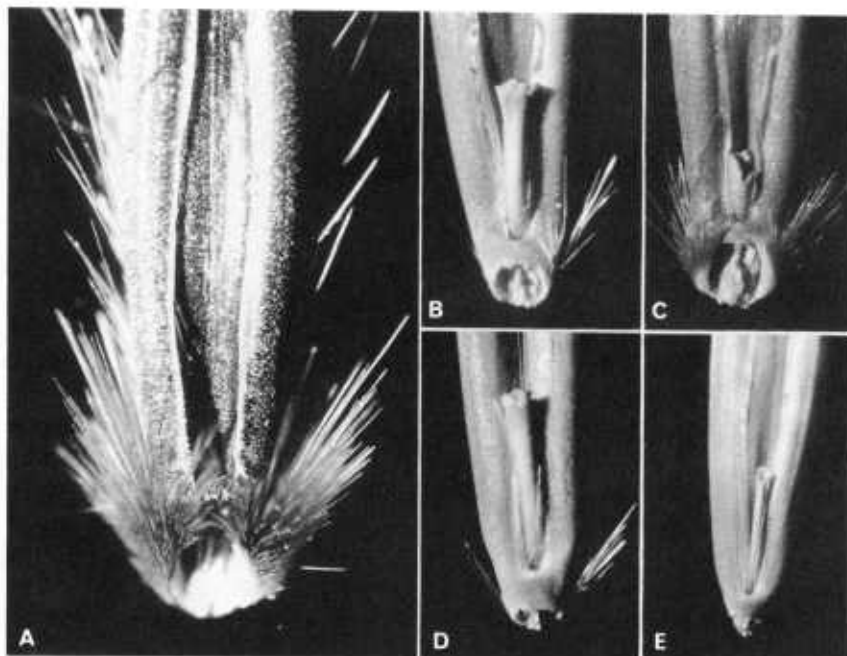


PN-4078

FIGURE 15.—Shape of base in *Aveua*: **A**, Prominent basal scar—left to right, *A. fatua*, *A. byzantina* var. Red Rustproof, and *A. sterilis*; **B**, basal scar obscure—left, *A. sativa* var. Kherson, and right, *A. byzantina* var. Burt; **C**, basal scar absent—left, *A. byzantina* var. Burt, and right, *A. sativa* var. Victory.

adhere to and enclose the florets of the spikelet until just before pollination and fertilization. Thereafter, the glumes do not adhere, and at maturity the florets are free from the outer glumes.

The first floret is attached to the terminal pediculate node, and subsequent florets are attached singly at the nodes of the more or less zigzag, jointed rachilla. The lower or basal portion of the lemma of each floret enfolds, supports, and solidifies, forming a callus at the base of the lemma and the rachilla segment, to which is attached the next floret above. The structural arrangement of the rachilla internodes and nodes, each with its solitary floret, is most easily observed in the spikelet of *A. nuda* oats. This system of nodes and internodes exists in both the naked and covered oats. Because of the zigzag structural arrangement of the rachilla, all subsequent florets, regardless of number, are arranged between the primary floret and the secondary floret above.



PN-4079

FIGURE 16.—Basal hairs (pubescence) in *Avena*: A, Numerous long; B, few long; C, numerous short (midlength); D, few short (midlength); E, absent.

The spikelets usually include two fertile florets, although some varieties are characterized by three fertile florets and occasionally even a fourth more or less rudimentary floret. Usually, however, only a membranous, vestigial, staminate flower exists. In *A. nuda*, usually three to six or eight or even more fertile florets are produced. The outer glumes or bracts are usually much elongated, compared with those in covered oats (fig. 8).

Glumes

The glumes (empty) or two outer bracts of the spikelet were referred to by Stanton (1955) as membranous appendages that surround the spikelet. He states, "They are broadly lanceolate, pointed, boat shaped, usually glabrous, and somewhat arched. The lower glume is just a little shorter than the upper one, and both are always somewhat longer than the lemma, or flowering glume, except in naked oats."

Likewise, the color of the glumes as a whole is not a satisfactory differentiating character. Although there is a variation from light green to dark green in immature spikelets, this difference is

applicable to the leaves and other parts of the plant as well. It is of value only in separating the varieties at about the time of full heading, when the color is most fully developed. In certain varieties (such as Cherokee) the glumes develop a distinct reddish color as they near maturity, and the color is useful for identification.

When mature, the floret of the covered oat includes the dry caryopsis (seed) tightly enclosed within its two protective glumes, the lemma (dorsal), and the palea or palet (ventral). Except in naked oats, these integuments usually adhere to the caryopsis in threshing operations.

The palea, or palet, the inner or upper bract or scale of the floret, is a thin membranous, parchmentlike scale, the margins of which usually interlock with those of the lemma. The palea is of little use in oat classification, except in varieties in which the palea is darker (usually gray) and the lemma is of a lighter shade of gray or is either yellow or white.

The characters of the lemma are of major importance in oat classification. Characters of the lemma include color; length; width; shape of base or callus; mode of separation of the second floret from the first; pubescence on the base, dorsal surface, and rachilla segment; awn presence and type; and prominence of the veins. In papers on oat classification by Etheridge (1916), Archer (1922), Marquand (1922), DeVilliers and Sim (1930), and Stanton (1955), all or nearly all these characters were included, although certain of them were accorded more importance by some authors than by others.

Five major color classes were recognized in this study: Black (including brown), gray, red, yellow, and white (or the absence of color).

We know, however, that lemma colors tend to grade into one another (plate 2). Under the climatic conditions existing at Aberdeen, Idaho, the color of the lemma develops much more normally than where the crop must depend on rainfall instead of irrigation for moisture. At Aberdeen, oats are grown by irrigation; atmosphere is bright and clear; and rains that can result in weathering and staining the delicate lemma colors are rare. This advantage was pointed out by Coffman (1964). The advantages in study of lemma color under these conditions cannot be minimized.

In the study reported here, length of lemma was carefully studied, but width, although measured, was not. Length is much less influenced by the environment. The length in millimeters in different varieties may vary from only 10 to 12 to 18 to 20 or more. The width may differ greatly among varieties. If climatic condi-

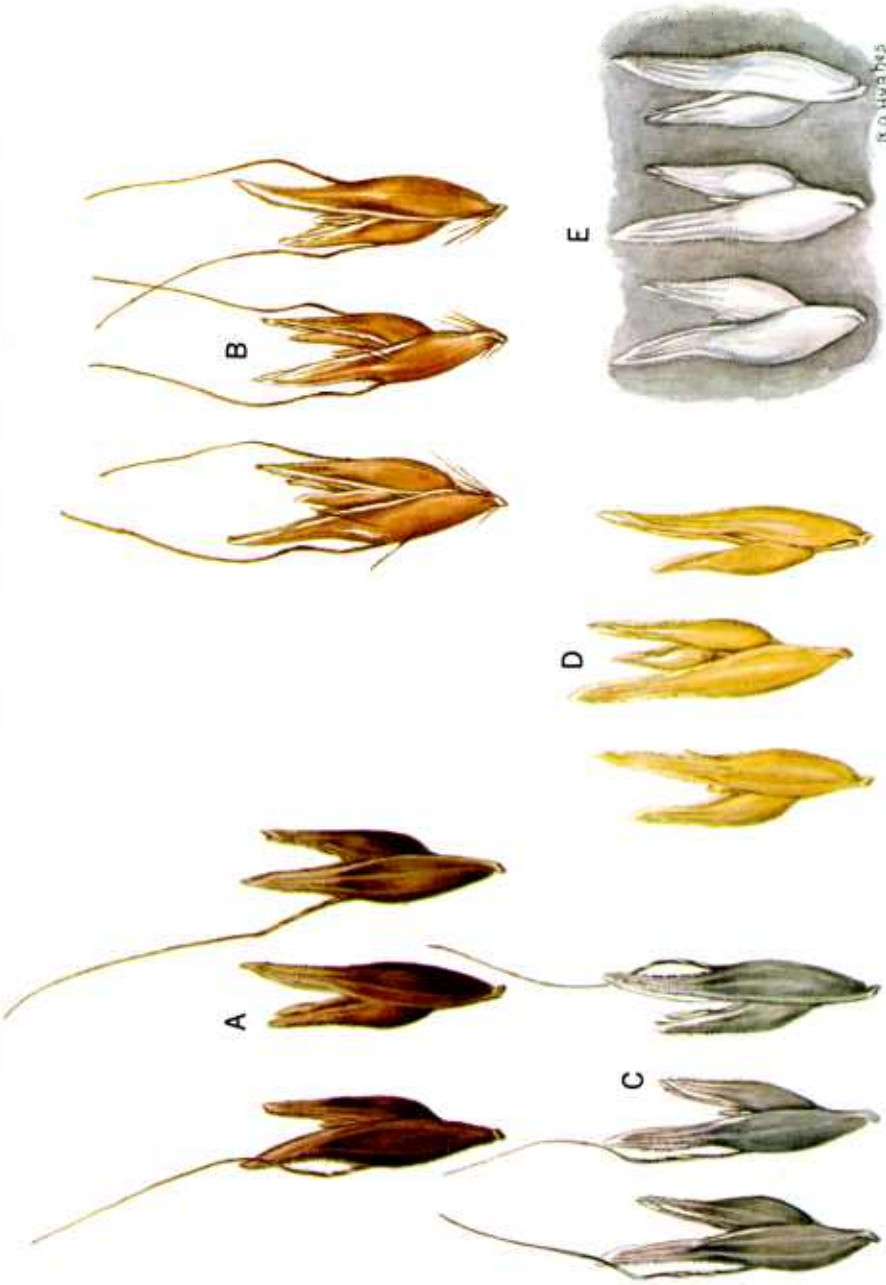


PLATE 2.—Lemna color in Arena: Black—A, Red—B, Gray—C, Yellow—D, White—E.

tions are unfavorable, the width of the lemma of any variety may be greatly influenced.

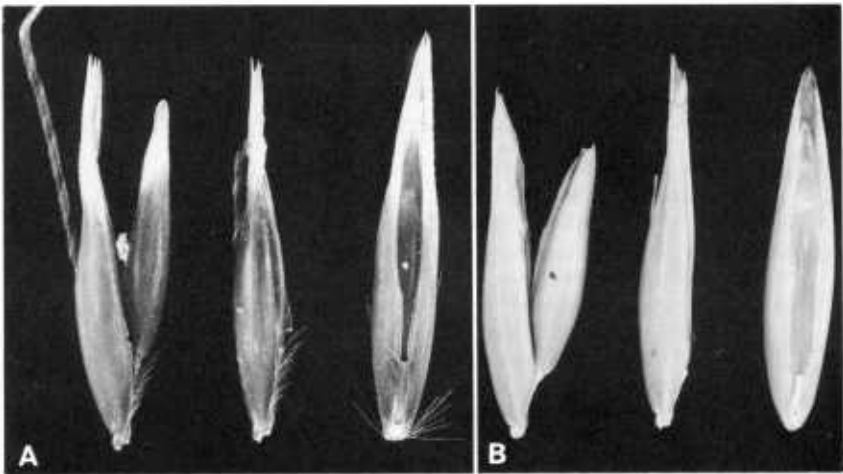
In general, the relationship of length to width usually determines the shape of the oat floret. There are also other characters that influence the shape. The five shapes of kernel used by Stanton (1955) were very slender, slender, midplump, plump, and very plump. He recognized these as being relative terms only, but useful for varietal identification.

These five terms also are used here. In addition, the shape of the dorsal side of the lemma is used as an added character. Certain varieties, such as Sparrowbill, have a more or less distinct "hump" in the lemma.

Pubescence

Except for certain varieties of red oats, cultivated oats usually lack profuse pubescence. Pubescence may be present at or on the base of callus (fig. 16), the dorsal surface of the lemma, and the rachilla segment or internode that supports each of the secondary florets of the spikelet (fig. 17).

The presence, extent, and length of basal pubescence is a useful character in oat classification. Coffman and others (1951), Coffman (1964), Coffman and Stanton (1925), and Stanton (1955) described different types of basal pubescence. Stanton (1955) classed them as follows: "(1) Numerous, long, midlong, and short; (2) several to



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FIGURE 17.—Pubescence of rachilla segment in *Avena*: A, Numerous, B, absent.

numerous, long, midlong, and short; (3) several, long, midlong, and short; (4) few to numerous, long, midlong, and short; (5) few to several, long, midlong, and short; and (6) few or absent."

A more simplified system is used here. Coffman (1964) indicated, as the result of extensive inheritance studies, that usually a few hairs can be observed on the base of a few florets of almost any cultivated oat; that genetically the most homozygous condition is that of numerous long basal hairs; that next to the numerous long basal hairs, numerous short basal hairs are most constant in breeding; and that length is a more stable character than numbers. The classes of basal pubescence used here were reduced drastically from the six classes and 17 subclasses included by Stanton (1955).

In addition to basal pubescence, the classification shown here used the pubescence on the sides and back of the lemma and on the rachilla segment that supports the second floret of the spikelet.

In the wild species *A. sterilis* and *A. fatua* (especially the former), the sides and back of the lemma usually are covered with profuse long hairs (fig. 16). Some *A. fatua* specimens may be very hairy, whereas others, except for hairs on the base, almost completely lack pubescence. A few cultivated varieties tend to have a few hairs on the backs and sides of the lemma, and their presence is useful for classification.

Pubescence characterizes the rachilla internode segment of a comparatively few cultivated varieties such as Black Mesdag. Coffman and others (1964) have shown this to be highly heritable.

Spikelet Separation

Coffman and others (1925) described spikelet disarticulation as follows:

The separation of the lower floret of the oat spikelet from the rachilla or axis of the spikelet is here termed spikelet disarticulation, in contrast to floret disjunction or the separation of the florets of the spikelet from each other. Few experiments have been conducted on the histology of the oat spikelet, and as a result the exact structure of the rachilla is not well understood.

In the wild species, *Avena fatua* and *A. sterilis*, and in most of the cultivated varieties the basal segment of the rachilla usually is short and thickened. Apparently, the basal segment of the rachilla and the projecting basal callus of the lower floret are united obliquely in the lateral plane, the callus being dorsal and the rachilla ventral. In the two wild species named, spikelet disarticulation takes place by means of an oblique abscission layer, apparently located in the cleavage plane between the basal rachilla segment and the callus of the lower floret. It

is possible that a true articulation between the base of the lower lemma and the apex of its supporting rachilla segment exists above this abscission layer, and that this abscission layer is formed in the tissue of the rachilla segment itself, but this is very improbable. Separation at this layer in that case would leave a portion of the basal rachilla segment attached to the lower floret.

It is assumed that the abscission layer is formed at the base of the callus of the lemma, and that below this abscission layer the tissue is rachilla, while above this layer it is lemma. In *Avena sterilis*, *A. fatua*, and some of their cultivated derivatives the separation at this definite oblique abscission layer leaves a well-defined deep oval cavity, commonly called the scar, or "sucker-mouth," in the face of the callus. A corresponding but shallower depression remains in the face of the disjoined basal segment of the rachilla or pedicel.

Zade (1918) states that connection between these two parts, the callus and the rachilla segment, is only at the periphery in the wild species, while in the cultivated oat, *A. sativa*, the central portion also is solid, being filled with a parenchymatous tissue. The writers believe his observations probably are correct for conditions at maturity, but that in fresh, immature plants the union of the rachilla and callus is solid both in wild species and their cultivated derivatives.

The cavity remains attached ventrally at the base.

In substance, Coffman and others (1925) described spikelet separation as resulting in one or another of three ways as follows: (1) Abscission when the method of spikelet separation was that characteristic of the wild *A. fatua* or *A. sterilis*, that is, resulting in a pronounced cavity or scar in the base of the lemma; (2) fracture when the method of separation was that most characteristic of the cultivated varieties of *A. sativa*, that is, resulting in roughened tissue with no observable cavity or scar at the base of the lemma; and (3) semiabscission when the method of separation was to some extent intermediate between the two, apparently resulting partly from abscission and partly from fracture, and leaving only a slight and often poorly developed cavity or scar in the base of the lemma.

These three types of spikelet separation have been employed in the varietal descriptions included in this classification. However, the shape of the base of the primary floret has been referred to as prominent when a large distinct cavity exists, obscure when the cavity is reduced or small and more or less irregular in shape, and absent when the base of the primary floret lacks a scar. This type of floret has been termed "pointed" by some authors.

Rachilla Segment

The characteristics of the supporting rachilla segment of the second floret have been much used in oat classification.

The length and width of this segment, especially when ex-

tremely long or extremely short, are useful in classification, although in most cultivated varieties the rachilla can be termed intermediate in length and width. In some classifications, attempts have been made to describe the minute characteristics of the shape of this segment. The rachilla segment in a few varieties may have minute characteristics such as longitudinal furrows or grooves or it may be extremely slender and decidedly ovate in cross section. These characteristics were not used in the present classification. Width has been termed very wide, wide, intermediate, slender, and very slender; and lengths have been recorded in millimeters.

Floret Separation

The attachment of the rachilla segment to the base of the second and subsequent florets is very firm in *A. sterilis* and in *A. byzantina*. The florets of the spikelet often remain attached during threshing. When forcibly separated, the segment breaks near its base, as pointed out by Coffman and others (1925).

Since 1925, additional information has been obtained and the earlier conceptions altered somewhat.

Previously, *A. fatua* was considered the progenitor type of *A. sativa*. Several researchers had implied, and some definitely stated, that separation in these two species was by abscission. Sampson (1954) termed separation in *A. fatua* and *A. sativa* as "identical." Coffman (1946) and Musil (1946) pointed out that floret separation in *A. sativa* was by fracture. Coffman (1964a) has recently described four types of floret separation in oats: (1) By fracture (distal), as in *A. sativa*; (2) by fracture (basal), as in *A. sterilis* and *A. byzantina*; (3) by abscission, as in *A. fatua* and the fatuoid aberrants; and (4) by semiabscission—where some florets in the same panicle separate by abscission, and others separate by fracture. The last type differs somewhat from the class "heterofracture" used by Coffman and others (1925) in which florets in the same panicle separate either by fracture (basal) or fracture (distal) or near the midpoint in the length of its rachilla segment. Coffman (1964a) terms such separation as heterozygous (fig. 17).

In this classification, three major types of floret separation are used: Abscission, semiabscission, and fracture. Fracture is subdivided according to that area of the supporting rachilla segment in which separation takes place into distal (top), basal (bottom), and heterofracture (near the median point or irregular or intermediate between the basal and distal).

Awn

The three distinct types of awns are twisted geniculate, sub-geniculate, and straight (fig. 18).

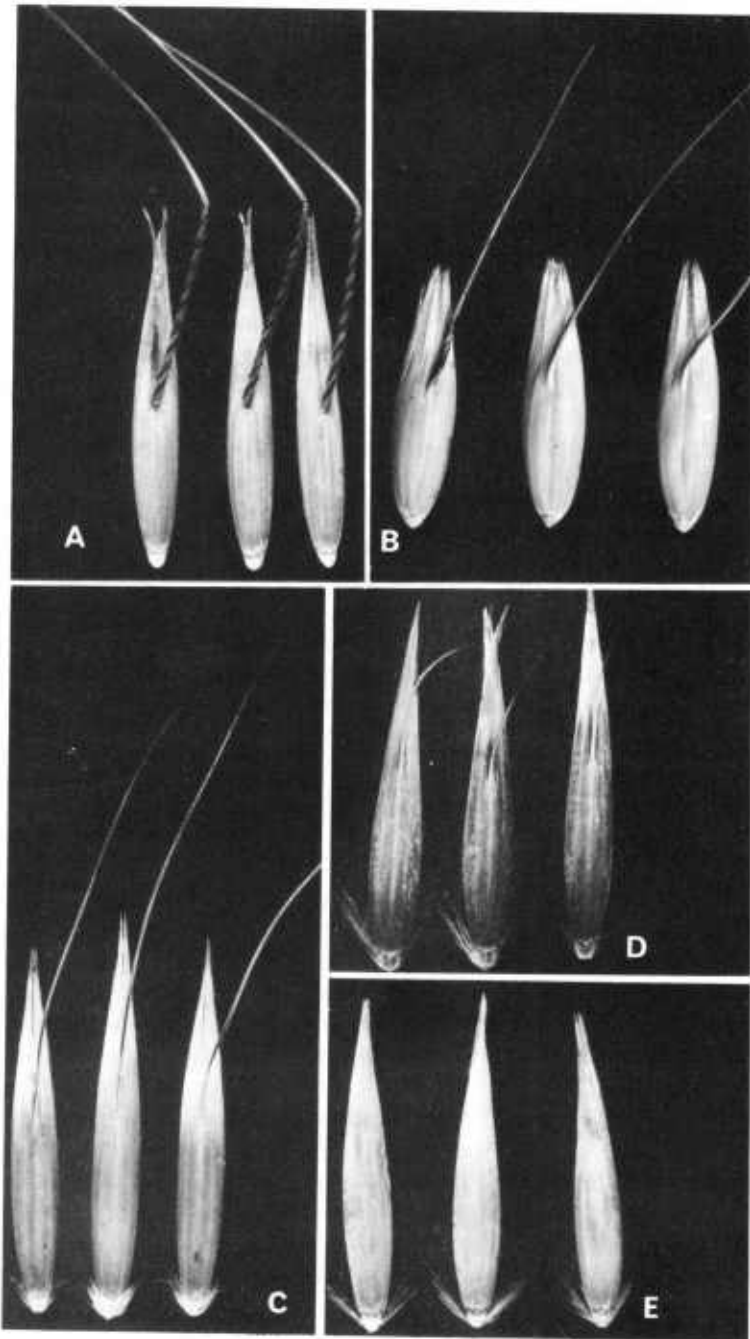
The twisted geniculate is probably the most true breeding of all awn types, especially when all florets are awned, as in *A. sterilis*. The different awn types are described in part as follows: (1) Twisted geniculate—"being stout and long with the lower portion twisted, of darker and lighter tissue, in a dextrous or clockwise direction and the upper portion bent over (kneel)." That length above the bend is light colored; (2) subgeniculate—"in cases where the twisting is less pronounced, and only one or two twists occur, the bending is too slight to be termed kneel" (Coffman and others 1925). The straight awn has been described rather loosely by some authors as "weak" and may include all awn types that are not twisted. The straight awn is usually not dark, but occasionally a variety may have straight awns with a darker pigmentation along the sides. The straight awn may differ in length in different varieties and may grade downward to mere bristlelike appendages.

From reported genetic investigations, an absolutely awnless variety is probably nonexistent (Coffman 1964). Climate has long been recognized as profoundly influencing the number, if not the type, of awns produced (Fraser 1919).

Caryopsis

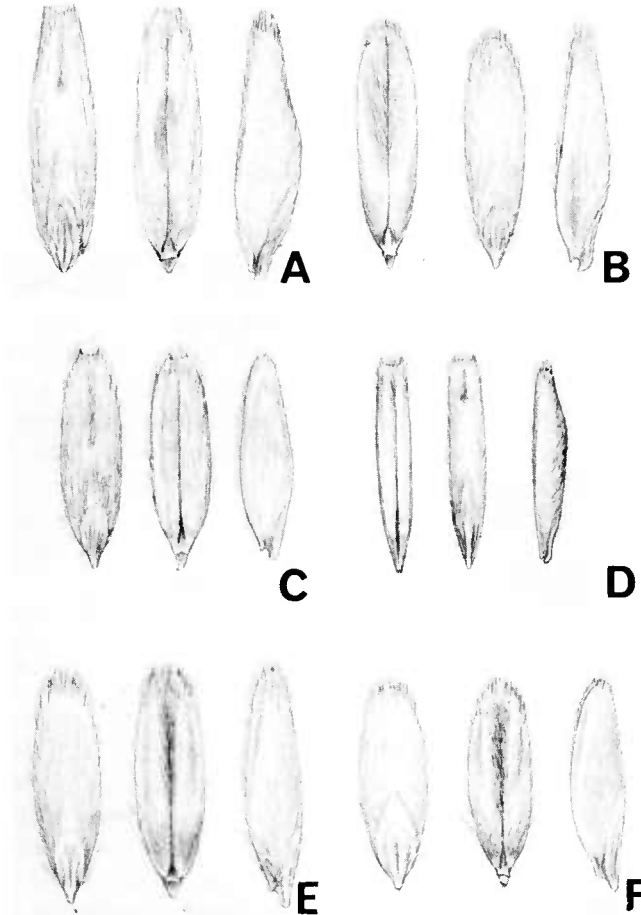
Bonnett (1961) states, "The oat grain is a caryopsis, a term applied to a small, dry indehiscent one-seeded fruit, with a thin, tight pericarp, originating from the superior ovary." As viewed from the dorsal side, it is long, slender, and elliptical. On the side opposite the embryo, a crease extends the entire length of the caryopsis. The embryo is on the anterior side near the base of the caryopsis.

Florell (1931) indicated that considerable variation existed in the size and shape of caryopsis and the shape of the scutellum. He indicated that considerable variation also existed in the extent and length of the pubescence, especially on the end of the caryopsis opposite the scutellum. However, as Stanton (1955) indicated, when the protective lemmas and palea are removed, only minor differences can be seen in the caryopsis of different varieties. Since the characteristics of the caryopsis are too minute to be of special value for identifying varieties, they were used to only a limited extent in the present classification (fig. 19).



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FIGURE 18.—Awn types in *Avena*: *A*, Twisted geniculate; *B*, subgeniculate; *C*, straight long; *D*, straight short; *E*, awns absent.



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FIGURE 19.—Caryopses of some species and varieties of oats: Top—**A**, *Avena sterilis maxima*, **B**, *Avena sterilis ludoviciana*; middle—**C**, *Avena fatua*; **D**, *Avena barbata*; bottom—**E**, *Avena byzantina*; **F**, *Avena sativa*.

HISTORY OF OATS IN NORTH AMERICA

Oats are not indigenous to the Western Hemisphere but were brought to North America from two parts of Europe. They were introduced by the Spanish into the southern part of North America, and into the northern part of the continent by the English and North Europeans.

The introduction of oats by the Spanish apparently came first. They were the first to establish a settlement in the United States

in what is now Florida. Although they first reached Florida in 1513, they did not settle there until 1565.

Influence of Moors on Spain and America

The history of Spanish explorers and conquerors in America reveals the influence of the Moors on Spain. Moors from North Africa had overrun and dominated Spain for centuries. They were intrepid horsemen and brought their horses, of Arabian derivation, to Spain. The Spaniards in turn brought horses and oats to feed them to America. It seems evident that the Moors had brought the culture of *Avena byzantina*-type oats to Spain. The Moors also introduced pottery-making into Spain. The Spanish, many of Moorish extraction, in turn, introduced adobe brick-making in America. Those adobe, clay bricks are now our single source of evidence that oats were brought to America by the Spanish close to four centuries ago (Hendry and Kelly 1925).

Spanish Oats in Southeastern United States

Although the Spanish first reached Florida in 1513, they did not start Fort San Marao, later named Fort Marion, at what is now St. Augustine, until 1566. In 1565 a settlement was established, although the fort was not completed until nearly a century later, and some 400 years ago. We have one clue concerning the presence of oats in Florida at an early date. The variety Suwannee (Stanton 1955, p. 131), as reported to be in Florida over 50 years ago, traces back a long time ago to a few ripening panicles of oats growing in a protected spot along the Suwannee River. These plants were harvested and the variety Suwannee resulted. The Suwannee River is about 100 miles west from St. Augustine, Fla., at one point, certainly within travel range of the Spanish horsemen. This gives the story of Suwannee oats some credence, plus the fact this little dull gray to black oat is definitely of *A. byzantina* derivation.

Oats in South Central United States

As yet no positive information is available indicating that oats were introduced by the Spaniards at an early date into the wide area from Florida to Eastern Texas. Also, we lack information on

introduction of oats by the French or by the French Acadians who came from Canada to Louisiana in 1755. Had the Acadians brought oats from Canada to Louisiana, they would not have been adapted to this radically different climate. Only oats of southern European types have proved adapted, and only a comparatively few of that general type have been grown successfully in Louisiana.

Oats in Texas

An investigation of "feral" oats in Texas and certain areas of Mexico was made by Atkins and others (1966). The term feral refers to escaped cultivated oats and naturally wild types. Such oats presumably trace to the Spanish who were in that area over 250 years ago. They built the Mission, San Antonio del Valera, in 1718. The chapel (the famous Alamo) still stands within the city of San Antonio, Tex. The Spanish word, Alamo, means cottonwood, a tree commonly grown in west-central United States, prized because of its drought resistance and rapid growth.

Atkins and others (1966) found many oat types along roadsides and similar locations in central and north-central Texas, in northern Mexico, and near Mexico City. They did not record locations at which each type of oat was found but included illustrations of kernels of *A. sterilis*, *A. fatua*, and different types of *A. byzantina*. They mentioned especially a small, black-kerneled oat that was found frequently over Texas. They quote the *Texas Almanac* of 1904 as stating, "As late as 1875 black oats was the variety planted in this (Texas) State." This statement is also of interest concerning the origin of the Suwannee black oat mentioned in connection with Florida.

Oats in Southwestern United States

No information is available concerning studies made of oats in connection with old Spanish structures built either in New Mexico or Arizona. Studies reported by Hendry (1931), Hendry and Kelly (1925), however, indicate the presence of oats in southern California and at one location in Mexico as early as 1780. Adobe bricks from buildings erected by the Spaniards were dissolved in water and the seed recovered sent to the Department for examination. The identifications of the seed were as follows:

<i>Species identified</i> ¹	<i>Location or source</i>
<i>A. byzantina</i> -----	San Vicente Ferrer, San Vicente, B.C., Mexico, built in 1780. Mission San Jose de Guadalupe, San Jose, California, built in 1797.
<i>A. byzantina</i> and <i>A. fatua</i> -----	Rancho Vallejo, Petaluma, Calif., built in 1834.
<i>A. fatua</i> -----	San Juan Bautista, San Juan Bautista, Calif., built in 1797.

¹ Identifications were made by T. R. Stanton and F. A. Coffman, U.S. Department of Agriculture.

The number of adobe bricks dissolved at each location is not known—possibly only a few were dissolved because of the historic value of the old Missions.

Two stories on origin of the variety Red Rustproof exist. An old seed catalog of Samuel Wilson, Mechanicsville, Pa., stated "A small bunch (of oat plants) were found growing on an old soldiers' camp ground in southwestern Georgia after the war was over (the war between the States, 1860–1865). They proved a great boon to farmers in that part of the country."

We are indebted to U. R. Gore of the University of Georgia, who examined old reports of the Georgia State Agricultural Society for 1876. Gore indicated that a Mr. Morrison of South Carolina claimed that a neighbor had oats that would not rust. They were called Red Mexican Rust Proof Oats, which were brought back from Mexico by a soldier (of the Mexican War) in 1848 or 1849. Red Rustproof is a contraction of this name.

I observed fields of Old Red Rustproof (Red Rustproof) oats in some areas of the Southern States some 50 years ago. Plants now considered typical of Red Rustproof were the predominant type, but a veritable "hodgepodge" of other types of plants was present. Many oat varieties, widely different morphologically, can be traced to Red Rustproof that was the predominant type when oat selection started in the Southern States about a century ago.

Oat varieties traced by selection or reselection to "Red Rustproof," include:

Appler	Columbia
Aurora	Culberson
Brunker	Ferguson 560
Burt	Forkeddeer
California Red	Frazier
Coast Black	Fulghum
Colburt	Fulwin

Hairy Culberson	Otoe
Hay	Pentagon
Kanota	Suwannee
Navarro	Tech
New Nortex	Tennex
Nortex	Trojan

Several have one or more synonyms. Both spring and winter varieties are included. They range from very early to rather late in maturity. Black, gray, red, yellow, and white kernel varieties are included, as well as those differing in length and number of awns, basal cavities (suckermouth), and pubescence. Among the varieties listed, Appler, California Red, and Nortex are more typical of the predominant type of Old Red Rustproof. Coast Black is a black rather than red oat of the predominant type mentioned.

Important Progenitor Varieties

The origin of five of these varieties is of special interest. Including oats of the Red Rustproof type, practically all oats grown from the Central States southward as well as along the Pacific Coast now trace to these oats.

The second important source of fall-sown oats in the United States, however, is Winter Turf. Some of these oats are shown in figure 20.

Burt apparently was one of the first oats produced in America. It was selected about 1878 from Red Rustproof by a man named Burt in Green County, Ala. (Coffman and others 1925). Four of the varieties listed resulted as selections from Burt: Colburt (black), Otoe (grayish-red), Brunker (red), and Trojan (white). Burt oats were variable, even some derivatives were genetically unstable (Coffman and others 1925).

Fulghum was selected from Red Rustproof by J. A. Fulghum of Warrington, Ga., about 1892 (Stanton 1955). The original plant attracted attention because of its earliness and height. Five panicles were saved and the Fulghum oat resulted about 1897. Although Fulghum appears to be comparatively uniform, a group of more winter-hardy types such as Pentagon, Forkeddeer, Tennex, and Fulwin resulted as reselections from it. Columbia, a decidedly different grayish-kerneled spring oat, is another derivative of Fulghum.

Culberson was a very different derivative of Red Rustproof. The story of its origin as related over 45 years ago by C. A. Moores of

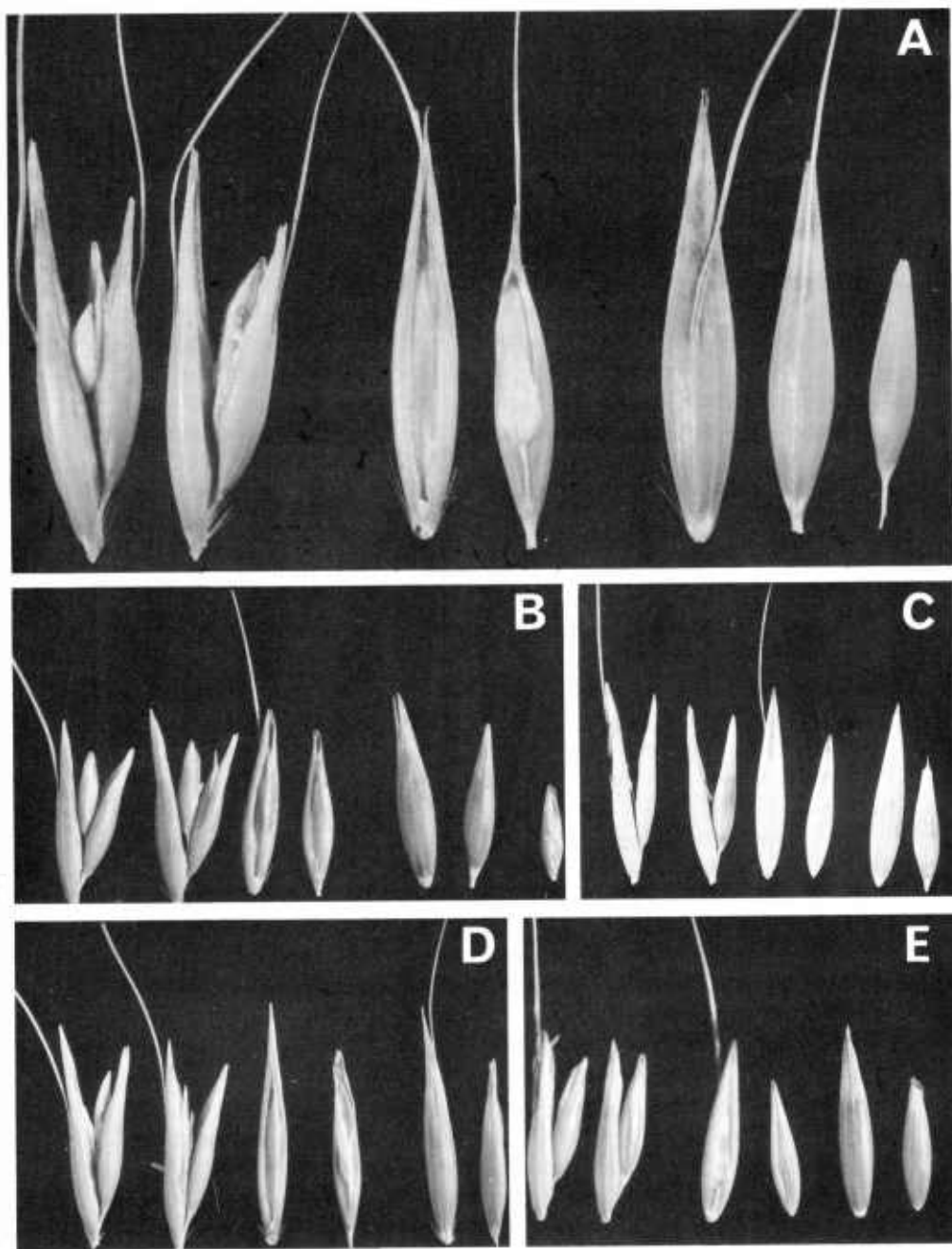


FIGURE 20.—Spikelets and florets of important progenitor varieties of fall-sown oats in the United States: A, Red Rustproof; B, Fulghum; C, Culberson; D, Burt; E, Winter Turf.

Knoxville, Tenn., is as follows—After an unusually severe winter in western North Carolina, a farmer by the name of Culberson saved seed of scattered surviving oat plants in his field of Red Rustproof. He bulked this seed and the variety Culberson resulted. C. A. Moores in 1906 made a selection from the original Culberson. C. W. Warburton of the Department named this new selection Dwarf Culberson because it was shorter than the original variety. Earlier, in 1904, Warburton had made a selection from Culberson from among progeny grown from seed received from the North Carolina Experiment Station at Raleigh, N.C. T. R. Stanton later selected Hairy Culberson that was long used as a winter hardiness check variety in uniform hardiness nurseries. Tech (V.P.I. No. 1), a black oat, was selected from Culberson by T. B. Hutcheson of the Virginia Agricultural Experiment Station at Blacksburg, Va., in 1908 (Stanton 1955).

Aurora, a plump-kerneled yellow oat, was selected from Red Rustproof (Appler) by C. W. Warburton at the Arlington Experimental Farm, Va., in 1909. It was a parent of the cross, Winter Turf \times Aurora, made by T. R. Stanton to produce Lee, one of the most famous winter oat varieties in the United States.

Another famous variety selected from Red Rustproof is Ferguson Navarro obtained by the Ferguson Seed Farms, Sherman, Tex. Its history is not entirely clear, but presumably it was selected by the Texas farmer who reported that it had appeared as a "stray plant" in his oat field. More recently the oat has been known just as "Navarro;" the Ferguson being dropped. Navarro has an unusually high degree of resistance to smut and has been much used to produce smut-resistant oats.

A Second Source of Winter Oats

Although most winter oats in the United States were derivatives of "Red Rustproof," one notable exception exists. This is Winter Turf, or "Virginia Gray," an *A. sativa* type, apparently introduced into Virginia from England some two centuries ago. Its history was reported by Coffman (1961, 1965). Today, oats grown from 40° southward in the United States are predominantly derivatives of *A. byzantina*, regardless of whether fall or spring sown. This notable exception exists among fall-sown oats.

Our one clue to history of oats in Virginia is supplied by Hayworth (1915). He stated that George Washington in his diary for 1764 recorded that he sowed "a few oats to see if they would stand the winter." In 1786, 22 years later, George Washington

seeded some 580 acres of oats, presumably at Mt. Vernon, Va. We lack definite information on the variety Washington used. It possibly was of the Winter Turf type. Winter Turf is considered a gray oat in America, but often is somewhat variable in intensity of coloring, depending on weather conditions and stage of maturity at harvest. Although Winter Turf was long considered the most winter-hardy oat in America (Coffman 1947), it is so late in maturity that its culture was limited primarily to Virginia and adjacent States, and to cooler areas of the coastal regions of Washington and Oregon. Today, fall-sown oats in those areas are often varieties derived from crosses between Winter Turf and certain more winter-hardy *A. byzantina* derivatives. In hardiness Winter Turf ranks far below our present most winter-hardy varieties in America.

English Oats in Spring-Sown Oat Areas

Mason (1853) and Flint (1874) reported that oats were first brought to the northern United States by Captain Bartholomew Gosnold in 1602, who "explored the coast of New Hampshire and Massachusetts and built a hut at Cuttyhunk, a small island some six to seven miles southeast of the southern tip of Massachusetts." Here Gosnold planted oats and other cereals.

Gray and Thompson (1941) stated that the first crops planted by the English colonists in America were sown in the spring of 1586 by Raleigh settlers. They indicated that these crops probably consisted of barley, oats, and peas. They also stated, "The colonists who inaugurated the first permanent English settlement at Jamestown (Virginia) arrived in the spring of 1607, and about June 3 they began to sow English grain." We now know that June 3 was probably 3 to 4 months too late in the spring for seeding any of the small grains in Virginia, if a grain crop was the objective. From their experience at Jamestown, it is understandable why oat production did not flourish in that general region for decades (until the Mennonite farmers came to the Piedmont area and the Shenandoah Valley about 1730-50).

Thornton (1933) indicated that under date of August 14, 1632, John Winthrop recorded, "This week they had in barley and oats at Sagus (exact location unknown) about twenty acres of good corn (i.e. grain), and sown with the plough." Mason (1853) stated, "In 1633 good crops of oats were raised at Lynn" (near Boston, Mass.).

With the expansion of oat production in the United States, interest in varieties increased. In the northern United States,

from the time of the first colonists until well into the present century, much reliance was placed on the importation of oat seed from Europe. Such seed imports dwindled after about 1920.

Oats Introduced Into Canada

Grant (1939) states: "to Louis Hebert goes the credit of being the first Canadian farmer. Landing in 1617 he cleared a plot of land which is now the upper section of Quebec City. Other habitants joined this pioneer and in half a century some 11,000 acres were under cultivation." Derick and Hamilton (1948) indicate that records reveal oats were grown in Newfoundland in 1622, and Derick (1953) indicated oats were grown on the Elizabeth Islands in 1602.

Important Progenitor Spring Oats Introduced Into the United States

Numerous oat varieties were introduced into this country from Europe during the three centuries previous to 1930. Most of these came from England or nearby countries and were spring oats. Among all those introduced the most important were:

<i>Variety</i>	<i>C.I. No.</i>	<i>Reg. No.</i>	<i>Source</i>	<i>Introduced</i>
Kherson (Sixty Day) ¹	459	22	Russia	1896
Green Russian	1978	18	Russia	² 1870
Victory	560	232	Sweden	1908
Markton	2053	52	Greece	1904
White Russian (White Tartar)	1614	42	Russia	² 1850

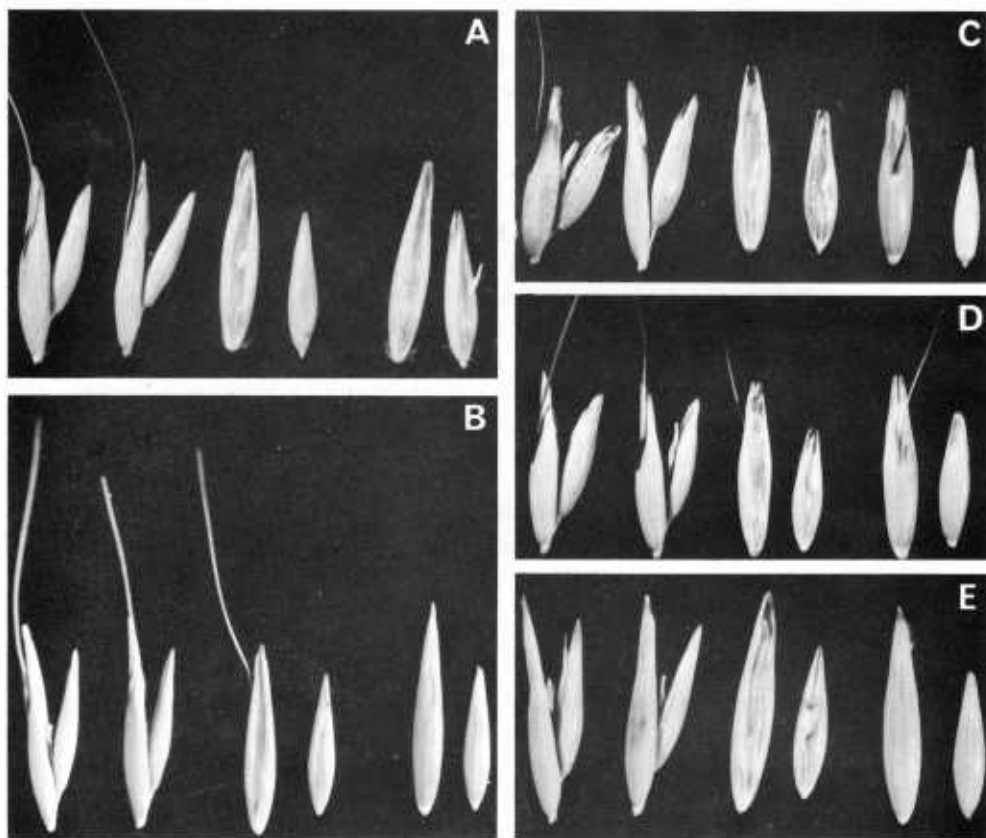
¹ Kherson and Sixty Day are considered synonymous.

² Approximate date and presumed source not clear.

A tabulation from various publications including registration articles was made of parents of improved oats released in the United States. From these sources I learned that up to 1970 the number of varieties released in the United States and Canada that trace to these five oats are as follows: Kherson—80, Green Russian—50, Victory—40, Markton—37, and White Russian—15. As a consequence, the major portion of spring-sown oats in America in 1970 traces to one or more of these five varieties through selection or hybridization, or both (fig. 21).

Histories of these five oats, consequently, are of special interest.

Kherson was introduced in 1896 by F. W. Taylor of the Nebraska



PN-4088 PN-4089 PN-4090 PN-4091 PN-4092

FIGURE 21.—Spikelets and florets of progenitor varieties of spring-sown oats in the United States: Spreading panicle—A, Kherson; B, Green Russian; C, Victory; D, Markton; E, side panicle—White Tartar.

Agricultural Experiment Station, Lincoln, Neb. Taylor obtained the seed in the Ukraine of southern Russia. He named the variety Kherson after the area from which the seed came. Kherson is close to the leading south Russian seaport of Odessa, on the Black Sea, near the Russian-Rumanian border, at about 47° N latitude.

In the United States 47° N passes east to west through North Dakota, somewhat north of the area in the United States where Kherson and its derivatives became dominant varieties during the period 1910 to 1940.

Sixty Day, believed to be the same oat as Kherson by Warburton and Stanton (1920), was received by the Department in 1901 from Dr. S. de Mozinski of Proskurov, Southern Podolia, Russia. Prosku-

rov is somewhat farther north in the Ukraine as well as closer to the Russian-Rumanian border than the Odessa area from which Kherson was obtained.

Although oat hybridization had attracted some interest early in this century, the introduction of Kherson from Russia and of Sixty Day (considered the same oat) by M.A. Carleton of the Department in 1901, resulted in a return to selection as the source of new varieties. During the period of about 1908 to 1915, over a dozen oat varieties resulted from selections made by the Department, several States, and Canada from that one source. Hybridization was relegated to minor importance for years as a result.

In North America Kherson was found to be a heterogeneous variety (Coffman and Stanton 1925). It proved an excellent source for selection. Selections from Kherson (Sixty Day) which were released follow:

<i>Variety</i>	<i>C.I. No.</i>	<i>Released by</i>
Albion -----	729	Iowa.
Cole -----	834	South Dakota.
Dasix -----	4161	Ontario.
Edkin -----	2330	Nebraska.
Fort -----	----	Illinois.
Gopher -----	2027	Minnesota.
Hudson -----	1906	New York.
Iogold -----	2329	Iowa.
Iowar -----	847	Iowa.
Nebraska 21 -----	1371	Nebraska.
Ohio 7009 -----	----	Ohio.
Richland -----	787	Iowa.
Richland 52 -----	3002	Iowa.
State Pride -----	1154	Wisconsin.

These varieties, released during the decades 1910 to 1930, occupied the major portion of the spring oat area of the United States and southern Canada from 1910 to about 1940, or for some 30 years.

Derivatives of Kherson differed not only morphologically, but also in reaction to major oat diseases, especially stem rust. This proved very important because of their wide distribution in the United States. As a consequence Kherson's influence on oats in the Northern States for several decades was somewhat similar to that of Red Rustproof in the Southern States, in providing a degree of natural protection against the ravages of stem rust.

Green Russian was introduced into North Dakota about 1870 by immigrants coming to this country from Russia. We lack informa-

tion about the area in Russia from which those settlers came, but they presumably brought oat seed with them. Green Russian was not homozygous and many selections were made from it, such as Rainbow (C.I. 2345), Iogren (C.I. 2024), and Morota (C.I. 2344). In disease nurseries, Rainbow had considerable resistance to certain stem rust and crown rust races (Stoa and others 1936). Consequently, in 1928, F. A. Coffman (Coffman and others 1938) crossed Markton, previously reported to be resistant to smut (Stanton and others 1924), with Rainbow to produce Marion (C.I. 3247), the first oat released in America having considerable resistance to each of the three major diseases of oats: Smut, crown rust, and stem rust.

Marion, then an unnamed selection, was included in regional uniform oat nurseries as early as 1935 and 1936. Because of its disease resistance, it soon attracted wide attention in the Corn Belt. Several States increased seed, made limited distribution, and pressed for naming the oat themselves. It was not officially named, however, nor officially released until 1940, and by then thousands of acres of the oat were being grown.

Victory, called Seger in Sweden where it was produced, was introduced into the United States in 1908 by David G. Fairchild of the Department. The oat was produced and seed obtained from the Swedish Plant Breeding Station, at Svälof, Sweden. Svälof is located some 40 kilometers (approximately 25 miles) north of Malmo, an important city in extreme southern Sweden where it borders on the Baltic Sea, slightly above 56° N latitude.⁴ In America 56° N passes to the north of Newfoundland across the southern area of the Hudson Bay, through British Columbia and far south of the main area of Alaska. Hence, *Victory* was produced far north of the corresponding area in the United States (North Dakota) where it became a leading variety.

At Svälof, *Victory* resulted as a selection made in 1892 by Hjalmar Nilsson from Milton (Probsteier), an old oat variety of the Baltic area. *Victory* is a very productive, midseason oat with exceptionally plump, white kernels, and few or no awns. It not only soon became popular in North Dakota and nearby Northern States, but the leading variety in more northern irrigated areas of the Western States. In the latter areas test weights above 40 pounds per bushel were frequent, as well as yields of 150 to 160 bushels per acre.

Because of *Victory*'s exceptional yielding ability and superior kernel quality, it was widely used in oat crossing in the United

⁴ Information received September 22, 1970, from the Swedish Embassy, Washington, D.C.

States and Canada. More than 40 oat varieties trace to Victory as a parent. The first cross involving Victory was made at the Minnesota Agricultural Experiment Station, St. Paul, Minn., in 1918. H. K. Hayes and R. J. Garber made the cross White Russian \times Victory from which the variety Anthony resulted. In 1923, G. A. Wiebe of the Department, stationed at the Aberdeen, Idaho Branch Experiment Station, crossed Victory with Markton. Some half dozen smut-resistant varieties resulted. Thereafter, smut, previously very destructive in the Northwest, was largely eliminated in the area.

Markton was selected from C.I. 357. Mark A. Carleton of the Department obtained the seed in 1904 from the exhibit sample of Louis Drefus & Co., at the Louisiana Purchase Exposition, St. Louis, Mo. The source of the seed exhibited was recorded by Carleton as "Dedeagatch, Turkey" (Stanton and others 1924).⁵

Markton resulted as a selection in 1911 from C.I. 357 (357-1) made by H. J. C. Umberger, then superintendent, Sherman County Branch Experiment Station, Moro, Oreg. It was sown in a "head row" in 1912. In 1913, four rows 8 rods long were grown. When about ripe, Umberger noted that the selection 357-1 "looked promising."

The oat made a creditable yield record at Moro, Oreg., and later was grown at Pullman, Wash., and elsewhere in the Northwest. At Pullman its smut resistance was noted by E. F. Gaines, cereal breeder at the Washington Agricultural Experiment Station.

The oat was named "Carleton"⁶ in 1922 and distributed to growers under that name (USDA; USDA Official Record, vol. 2, No. 20, p. 4, 1923). The variety was renamed "Markton," a contraction of Mark Alfred Carleton (Stanton and others 1924 and Stanton 1955), to conform with the rules against naming new varieties after living people formulated by the American Society of Agronomy.

Markton has been widely used as a parent, beginning in 1919, before knowledge of its smut resistance. T. R. Stanton crossed Sixty Day and Markton to produce the oat named Carleton (C.I. 2378). It was named after M. A. Carleton's death.

⁵ Maps of Turkey and Greece reveal that Dedeagatch is not in Turkey, but in Greece (Atlas of the World). Dedeagatch appears as a seaport in northeastern Greece, about 41° N latitude and 40 to 50 miles west of the Greece-Turkey border on the north shore of the Aegean Sea, where a comparatively narrow strip of Greece extends eastward. Stanton gives the seaport from which the oat (C.I. 357) came as "Dedeagach (Alexandroupolis)."

⁶ In honor of M. A. Carleton who obtained the original seed of C.I. 357 at St. Louis, Mo., in 1904.

After discovery of Markton's smut resistance (Stanton and others 1924), the oat was widely used in crossing to produce new smut-resistant varieties. By 1970 at least 37 varieties had been released that traced to Markton. Naked or hull-less oats formerly were very susceptible to smut. To date five naked oats have been released in the United States that include Markton among their parents and all have smut resistance.

Markton apparently has genes for winter hardiness as well as those contributing to yield and smut resistance. R. P. Bledsoe of the Georgia Agricultural Experiment Station, Experiment, Ga., crossed Markton and Red Rustproof to obtain C.I. 3430. It was grown for five years, 1937 to 1941, in Uniform Winterhardiness Nurseries (135 nurseries) (Coffman 1942). C.I. 3430 survived on the average 73.4 percent, while Winter Turf, the check variety, survived 71.4 percent. Survival of Applier (Red Rustproof) in the same series was 62 percent. The increase over Applier was over 11.7 percent, apparently contributed by Markton. Unfortunately, C.I. 3430 lacked rust resistance; hence, it was not released.

White Russian (White Tartar) was introduced into North America by early Russian settlers in North Dakota. They probably brought it from central or northern Russia about 1850. White Russian (C.I. No. 1) is a late-maturing, stem rust-resistant oat with a unilateral or "side" panicle. It was originally grown in the northern area of this country from Lake Michigan to the eastern plains of Montana, and in Canada. It has been used as a parent in crossing, and some 15 stem rust-resistant varieties have resulted.

Oat Crossing Begins in America

The history of the production of oat varieties in the United States reveals that the first oat crosses were made about 1870 by Cyrus Pringle of Charlotte, Vt. He released Pringle Progress and American Triumph about 1875. Parents of those were Excelsior × Chinese Hull-less and Excelsior × Waterloo, respectively.

Hybridization of oats was started about the same time in England as in America. Hunter (1924) indicated that Patrick Sheriff of England made his first oat crosses shortly before 1870.

To date we have no evidence that oat crosses were made in the United States after those of Pringle until M. A. Carleton made several in 1895.

M. A. Carleton noted in 1894 at Fargo, N. D., that the variety White Russian resisted rust. In 1895, at Manhattan, Kans., Carleton crossed White Russian with other oats to transfer rust resist-

ance. This presumably was the first specific attempt to breed for disease resistance in oats through hybridization in either America or Europe. The F_1 plants were destroyed in 1896 by a disastrous drought in that area of Kansas. Two years later, J. B. Norton, a student at Kansas State University, Manhattan, made a few successful oat crosses, but they also were lost. No information was found on the parents he used. In 1907, Norton, then a member of the Department's Cereal Staff, working at the Arlington Experimental Farm, made a large number of oat crosses. Three varieties resulted: Wayne (C.I. 1590), released in Ohio from the cross Sixty Day \times Clydesdale; Culred from the cross Red Rustproof \times Culberson; and an unnamed selection from Burt \times Sixty Day. Culred was released in a very limited way in the winter oat area, and the unnamed selection only to a limited extent in western Kansas and eastern Colorado. Breeding for disease resistance had not yet become the major objective.

Records obtained do not reveal many oat crosses were made during the decade 1900 to 1910 except those made by Norton and only two others in the 5 years, 1911–16. In 1911, B. D. Leith, of the Wisconsin Station, Madison, crossed Big Four with Sixty Day and the variety White Cross, C.I. 2026, resulted.

In 1916 at the Arlington Experimental Farm, T. R. Stanton made the cross Winter Turf \times Aurora and the famous winter oat variety Lee, C.I. 2042, resulted.

In 1918 crossing to produce disease-resistant oats in the United States started at the Minnesota Agricultural Station, St. Paul. H. K. Hayes and R. J. Garber made oat crosses. From the cross White Tartar (White Russian) \times Victory, the variety Anthony, C.I. 2143, resulted and from the cross Minota \times White Tartar (White Russian), the oat Minrus resulted.

Also, working at Iowa State University, Ames, in 1918, S.M. Dietz crossed Richland \times Green Russian to produce Hawkeye, C.I. 2464, and the two famed unnamed strains D 67 and D 69, C.I. No's. 2870 and 2463, respectively.

Early Oat Hybridization in Canada

Possibly oat hybridization in Canada became important earlier than in the United States. William Saunders of the Canada Department of Agriculture reported that his Department had started crossing oats about the same time as the Garton Brothers Co. of England, who made their first cross about 1885, Saunders indicated that some "40 to 50" oat crosses had been made in Canada at the time J. B. Norton (1907) of the United States

reported his oat-crossing work in 1907. The number of superior varieties resulting from the crosses mentioned by Saunders apparently has not been published.

Welsh and others (1953) indicated Laurel, Legacy, and Liberty resulted from crosses made in 1906; Erban from one made in 1907; Acton and Cartier from crosses made in 1913; and the Ripon and Mabel varieties from crosses made in Canada in 1918 and 1919, respectively.

Role of Commercial U.S. Oat Breeders in Winter Oat Areas

A few privately owned commercial companies have through their own efforts produced and released valuable oat varieties to American growers. Among such the most notable in the South has been Coker's Pedigreed Seed Co., Hartsville, S.C. They produced and released the winter oat Victorgrain (C.I. 5355) Reg. No. 137, at one time a leading winter oat variety in America. Some 10 varieties released by Coker's since Victorgrain trace to Victorgrain in their parentage. Coker's has conducted an oat breeding and varietal testing program for more than 50 years.

Other private companies which have produced important winter oat varieties have been Ferguson Seed Farms, Inc., of Sherman, Tex., and T. W. Woods and Sons, Seed Merchants, Richmond, Va.

Role of Commercial U.S. Oat Breeders in Spring Oat Areas

For decades many oat seed-producing firms existed in the Northern States, such as the John A. Salzer Seed Company, La Crosse, Wis., which in 1895 released "The Nameless White Beauty." In 1896 the name Silvermine (C.I. 1013) was selected as a result of a contest in which names were proposed. Silvermine, Reg. No. 30, was a superior midseason, spring-sown oat popular in America for 30 years.

Most commercial oat-breeding firms ceased to exist after 1920-30 when breeding for disease resistance started.

In the past 20 years the W. O. McCurdy and Sons Seed Co., of Fremont, Iowa, has been one of the successful commercial companies producing oat varieties. Five of their oats are Colfax (C.I. 7595), Goldcrest (C.I. 7596), Goldfield (C.I. 7597), Jewell (C.I. 7598), and Mahaska (C.I. 7599), all registered with No.'s 181, 182, 183, 184, and 185, respectively.

Important Disease-Resistant Varieties

Breeding for disease resistance in oats in the United States has been a paramount objective in both Southern and Northern States

since about 1930, when hybridization became important. The major diseases of oats in America have been:

Crown rust	(<i>Puccinia coronata</i> f. sp. <i>avenae</i>)
Stem rust	(<i>Puccinia graminis</i> f. sp. <i>avenae</i>)
Covered smut	(<i>Ustilago kolleri</i>)
Loose smut	(<i>Ustilago avenae</i>)
Victoria blight	(<i>Helminthosporium victoriae</i>)
Barley yellow dwarf virus	(Often referred to as "BYDV")
Soil borne mosaic virus	(<i>Marmor terrestre</i>)

More attention has been accorded breeding for crown rust resistance than for resistance to any of the other diseases of oats.

OAT "RUST TESTER" VARIETIES

The following are the rust differential varieties used at the present time in the United States:

Crown rust differentials

Name	C.I. number ¹
Anthony	7001
Victoria	7002
Appler	7003
Bond	7004
Landhafer	7005
Santa Fe	7006
Ukraine	7007
Trispermia	7008
Bondvic	7009
Saia (<i>Avena strigosa</i>) ²	7010

Stem rust differentials

Gene ³	Name	C.I. number
<i>P. graminis</i> (Pg) = Pg-1	Minrus	2144
Pg-2	Richland	787
Pg-3	Jostrain	2660
Pg-4	Rodney	6661
Pg-8	Eagle ² × (C.I. 4023: Hajira-Joanette)	8111
Pg-9	Santa Fe	5844

¹ Most of these varieties have more than one C.I. number, but these are the numbers used today.

² Saia C.I. 7010 is a tetraploid, all others are hexaploid.

³ Refers to genes for stem-rust resistance.

The important sources of disease resistance used in breeding are as follows:

<i>Variety</i>	<i>C.I. No.</i>	<i>Disease</i>	<i>Country of origin</i>
Ballard -----	6980	Soilborne mosaic, Victoria blight.	U.S. (Spain).
Black Mesdag	1877	Smut	France.
Bond -----	2733	Crown rust, smut, Victoria blight.	Australia.
Fulghum -----	708	Smut, Victoria blight, barley yellow dwarf virus.	U.S. (Spain).
Hajira -----	1001	Stem rust	Algiers.
Joanette (Jostrain).	2660	Stem rust	France, U.S.
Landhafer ----	3522	Crown rust, smut	Uruguay.
Markton -----	2053	Smut	Greece. ¹
Navarro -----	996	Smut, Victoria blight	U.S. (Spain).
Rainbow -----	2345	Stem rust, crown rust	U.S. (Russia).
Richland -----	787	Stem rust, halo blight	U.S. (Russia).
Santa Fe ² ----	4518	Crown rust, halo blight	Argentina.
Trispermia ----	4009	Crown rust	Bohemia.
Victoria -----	2401	Crown rust, smut, halo blight	Argentina (Uruguay).
White Russian (White Tar- tar).	1614	Stem rust	Russia.
Ceirch du Bach	2923	Crown rust	Wales.
Canuck: (Hajira- Jostrain).	4023	Stem rust	Canada R.L. 811.
Hajira x Banner	7438	Stem rust	Canada R.L. 848.

¹ Turkey originally reported as source of Markton.

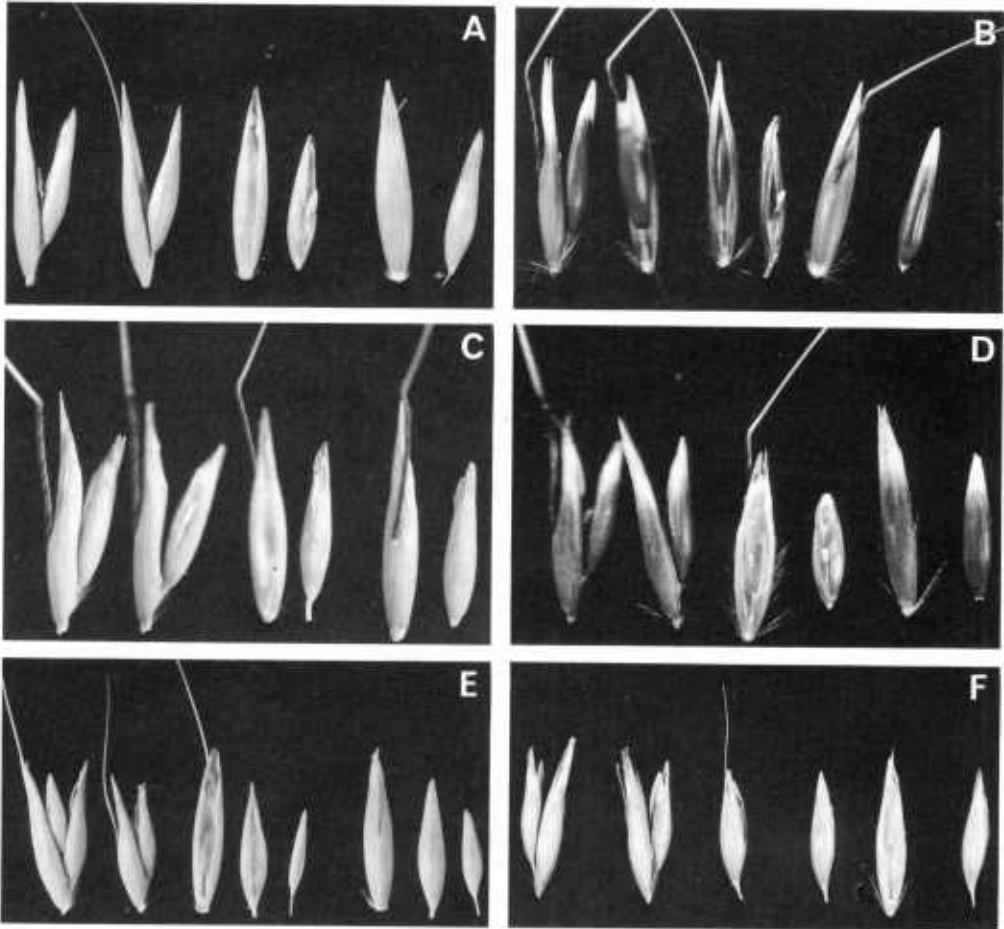
² And other C.I. numbers. Spikelets and florets of some of the oats are shown in figure 22.

Victoria, was the first oat in America with high resistance to crown rust. It was received in 1927 from Argentina via Enrique Klein, Criadero Argentina de Plantas Agrícolas, Pla, Argentina, and Alberto Boerger, Instituto Fitotecnico y Semillero Nacional at "La Estenzuela," Departamento Colonia, Uruguay (Stanton 1955). They indicated *Victoria* originated as a bulk of three selections, 64q, 64r, and 64t, from a variety "grown for many years in Uruguay." Apparently, this bulk was named *Victoria*. It was increased, distributed, and grown for some years in Argentina, before its introduction into the United States.

Stanton (1955) indicates a second lot of seed of this same variety was received later by the USDA. It was sent under the name

"*Avena victoria*," and was assigned C.I. 2764. This lot was received from Jose M. Scasso, Agronomo Regional Marón, Province of Buenos Aires, Argentina. In the United States this second Victoria was distributed to a few stations under the name Scasso, C.I. 2764.

Victoria, C.I. 2401, was the first oat observed to be highly resistant to crown rust in the United States. This observation was made in late June 1929 by scientists from the Department and



PN-4093 PN-4094 PN-4095 PN-4096 PN-4097 PN-4098

FIGURE 22.—Spikelets and florets of specified varieties of oats important as sources of resistance to disease: A, Richland (stem rust); B, Black Mesdag (smut); C, Victoria (crown rust); D, Joannette (stem rust) Hajira \times Joannette (important source stem rust resistance); E, Bond (*Helminthosporium victoriae*) (crown rust); F, Landhafer (crown rust).

Kansas State University in the oat nursery of Dr. J. H. Parker at Kansas State University.

The importance of this discovery was fully realized because up to that time no oat known in America was highly resistant to crown rust. Later Victoria was crossed with Red Rustproof and other varieties at Aberdeen, Idaho. Victoria \times Red Rustproof was presumably the first Victoria cross in the United States.

Learning of the rust resistance of Victoria, H. K. Hayes and associates at the Minnesota Agricultural Experiment Station, St. Paul, Minn., made several crosses during the summer of 1930, using Victoria as a parent.

Those crosses made at Aberdeen and St. Paul were disappointing. Victoria was not homozygous for crown rust resistance, and in all the first crosses rust-susceptible plants were by chance used as parents.

Early in 1930, T. R. Stanton and F. A. Coffman of the Department made crosses between Victoria and Richland, Nortex, Fulghum, and Kanota. Stanton's cross, Victoria \times Richland, resulted in a single F_0 seed, and Coffman obtained only one or two seeds in each of the three other crosses.

The progeny of those few seeds were destined to change oat production in the United States. From Stanton's single crossed seed, six varieties eventuated: Boone, Tama, Vicland, Vikota, Cedar, and Control, released in Iowa, Iowa, Wisconsin, South Dakota, Nebraska, and Iowa, respectively.

From the progeny of Victoria with the three red oats, seven varieties resulted. From the cross with Nortex, came Ranger, Rangler, Rustler, Carolina Red, and Tift. These were released in Texas, South Carolina, and Georgia. The cross with Fulghum resulted in Fultex, released in Texas. Quincy Red was derived in Florida from the cross of Victoria with Kanota. These 13 varieties, all released in oat-producing areas of the United States just before or shortly after 1940, brought a tremendous shift in oat varieties grown in this country, especially the Victoria \times Richland varieties in spring-sown oat areas. The story concerning the influence of that single F_0 seed of the Victoria \times Richland hybrid is probably one of the most fabulous in the field of plant hybridization in world agriculture. During the war years in the United States, 1940-46, oats were selling close to or above \$1 a bushel and the increased yield of progeny from that Victoria \times Richland hybrid kernel is estimated to have meant at least a half billion extra dollars to American farmers.

The decline in acreage of Victoria \times Richland derivatives came as rapid as expansion had been. In the early 1940's, Frances

Meehan (Latterall), a graduate student of H. C. Murphy at Iowa State University, brought to Murphy's attention a new disease present in the Victoria oat plants in her greenhouse. This disease was identified, described, and named *Helminthosporium victoriae* (Meehan and Murphy 1946).

Victoria blight spread rapidly in commercial oat fields and proved to be extremely destructive. Thereafter, use of Victoria as a parent in oat crossing declined. It was soon found that a high degree of crown rust resistance without accompanying susceptibility to *H. victoriae* was obtainable from other sources (Poehlman & Kingsolver 1950). The Missouri Agricultural Experiment Station released Mo. 0-205, Victoria \times Richland 2 \times Columbia, made by B. M. King of the Missouri Station; potentially one of the most productive early-maturing, spring-sown oats produced in North America up to 1970. Mo. 0-205 has been much used as a parent in crossing. A second oat having crown rust resistance but lacking susceptibility to *H. victoriae* was Sauk, produced in Wisconsin by H. L. Shands and D. C. Army from crossing Victoria \times Richland 2 \times Forward. Since 1950 Victoria itself has been little used in oat breeding, but several *H. victoriae*-resistant varieties tracing to Mo. 0-205 or to Sauk have been produced. In general, such oats do not have all the genes for crown rust resistance present in Victoria, but they do have marked resistance.

Bond was used as a parent for both spring and winter oats. The complete history of the oat variety Bond, C.I. 2733 (P. I. 80229), has not been fully assembled. We do know that the variety was introduced from New South Wales, Australia, by the Department in 1929. The oat resulted from crossing a strain of *Avena sterilis* with Golden Rain (Stanton 1955, p. 77). The "*A. sterilis* strain" was received in Australia in 1918 from Dr. L. Trabut of Algeria, North Africa.

Today, Trabut's oat probably would be considered a "Red Algerian" oat in the United States. It does differ greatly morphologically from the typical Red Rustproof type oats in this country. The history of Golden Rain (Svalöf's Guldregnahre) is known. It was selected from the oat Milton in 1892 by Hjalmar Nilsson at Svalöf, Sweden. Thus, Golden Rain's history is similar to that of Victory. In most morphologic characters Golden Rain is similar to Victory, except for lemma color. Golden Rain has yellow and Victory has white lemmas.

Because of Bond's derivation, it was included in the Uniform Winter Hardiness Nurseries in 1933 and 1934 (Coffman 1941). Bond survived only 42.5 percent compared with 73.7 percent for Appler in 36 nurseries in the 2 years, in which differential winter killing

was noted. This percentage clearly indicated that Bond lacked hardiness. It was, however, resistant to many races of crown rust and to *H. victoriae*. Bond has exceptionally plump kernels and stiff straw.

In 1931, H. K. Hayes and associates of the Minnesota Agricultural Experiment Station crossed Bond with Anthony and several other oats; in 1932, H. C. Murphy of the Department and Iowa State University crossed Bond with D69 (Richland \times Green Russian) and also several other oats. During the decades since 1931, many crosses were made in which Bond was a parent. Following the spread of crown rust race 45, to which Bond was susceptible, oat breeders turned to other varieties as parents in crossing, often using Bond hybrid derivatives as one parent.

By 1970 some 79 spring-sown and 39 fall-sown oats released to growers in the United States included Bond in their parentage. As a consequence, Bond, introduced in 1929, has been included among the parents of more hybrid-derived spring and winter oat varieties than any other single progenitor variety.

Landhafer, *Santa Fe*, *Trispermia*, and others were used after Victoria and Bond as additional sources of crown rust resistance in oats.

Landhafer was introduced into the United States as Landhafer aus Uruguay in 1938. Seed was received by H. C. Murphy from W. Straib of Germany. The name was shortened to "Landhafer" and assigned C.I. 3522.

Santa Fe was received by H. C. Murphy from Jose Vallega of Argentina in 1945. It has been given several C.I. numbers.

Trispermia, C.I. 1776 (and other C.I. No.'s), was obtained by Murphy from Canada in 1941. The Canadians procured it from Rumania in 1936.

Another more recent source of stem-rust resistance in oats is represented by the Hajira-Joanette derivatives from Canada. Hajira apparently came originally from Algeria and was called "Hajira rustproof oats." Joanette was an oat received from France in 1888-89 by C. A. Zavitz, at Guelph, Canada.

Other varieties having disease resistance appear in pedigrees of oats released in the United States. Among these are Jostrain, a selection from Joanette made in 1919 by W. L. Gordon of the Dominion Laboratory of Plant Pathology, Winnipeg, Manitoba, Canada; Ascencao, which came from South America by way of Canada in 1955; and Ukraine (Russia No. 7, Mutica Ukraine) obtained in 1930 by J. G. Dickson while traveling in Russia. Hajira-Joanette derivatives have been used in more breeding programs than either Ascencao or Ukraine.

Derivatives of crosses including Victoria, Bond., Landhafer, Santa Fe, Trispernia, Hajira-Joanette, and Hajira-Banner were, by 1970, approximately as follows:

<i>Spring-sown varieties</i>		
<i>Parent</i>	<i>Number registered</i>	<i>Number not registered</i>
Victoria -----	45	15
Bond -----	¹ 52	26
Landhafer -----	17	8
Santa Fe -----	7	5
Hajira-Joanette -----	5	4
Hajira-Banner -----	² 21	4
<i>Fall-sown varieties</i>		
Victoria -----	33	20
Bond -----	29	10
Landhafer -----	11	3
Santa Fe -----	8	1
Trispernia -----	5	1
Hajira-Joanette -----	7	1

¹ Plus 1 spring-sown hull-less oat.

² Spring-sown oats.

During the past 20 years the pedigrees of varieties released have become more and more complex. Many of those released in recent years have several of these "key parents" included in their parental background.

VARIETAL REGISTRATION IN THE UNITED STATES

Varietal registration of oats was started by the American Society of Agronomy in 1926 (Stanton and others 1926). The first 42 varieties were included as "standard varieties." The source of these varieties, so far as possible to obtain that information, was published (Coffman and others 1961). A total of 36 spring-sown and 6 fall-sown oats were included. By far most (10) of them came from the British Isles and five each from Russia and Sweden. Only 9 of the original group of 42 were of U.S. origin. Of these, five were fall-sown and four spring-sown oats. The sources of these 42 oats were as follows:

<i>Winter oats</i>		<i>Number</i>
United States	-----	¹ 5
England	-----	1
<i>Spring oats</i>		
British Isles	-----	10
Russia	-----	5
Sweden	-----	5
United States	-----	4
France	-----	3
Canada	-----	2
Finland	-----	1
Germany	-----	1
New Zealand	-----	1
Spain	-----	1
Source unknown	-----	² 3

¹ All selected from Red Rustproof type oats, apparently originally of Spanish origin.

² Their source is not known but Green Russian apparently came from Russia; Black Diamond and Monarch are black oats believed to be from Western Europe.

In addition to the 42 "standard varieties" 22 others were designated as "improved varieties" making a total of 64 included by Stanton and others (1926). All oats registered since 1926 have been included as improved varieties. Up to December 1972, registered varieties included 75 fall-sown and 175 spring-sown oats.

Not all oats produced and released from 1926 to 1973 have been registered. Nonregistration may not be an indication of lack of merit, but more than often occurs because of neglect on the part of the originator to obtain registration. Since 1926, only a few varieties produced outside the United States (in Canada) have been registered by the American Society of Agronomy. Table 1 lists the varieties of oats registered by the American Society of Agronomy.

Two important facts concerning oat variety registration are (1) only one "naked" or hull-less oat (James, Reg. No. 155) has been registered to date, although five such oats have been released, and (2) except for the eight unilateral or side oats included among the original 42 standard varieties, no additional side oat has been registered since 1926 and none such has been released to growers in the United States.

A study of the oats registered through 1973 reveals (1) the increase in winter oats produced in the past two decades, and (2) the radical change which has resulted, starting in 1941-50, in the percentage of oats resulting from hybridization.

TABLE 1.—*Summary of the original 42 standard and 208 improved varieties of oats registered by the American Society of Agronomy from 1926-73*

Period	Total regis- tered	Registration numbers	Varietal type and mode of origin					
			Spring oats, total		Resulting from—		Fall oats, total	Resulting from—
			Selection	Cross	Selection	Cross		
Prev. 1923 ¹	42	1-42			30	6	6	0
1926-30	35	43-77			28	3	4	1
1931-40	14	78-91			4	7	3	1
1941-50	21	92-112			1	15	5	4
1951-60	58	113-170			0	334	24	422
1961-70	66	171-236			51	37	28	28
1971-72	14	237-250			0	69	5	5
All	250	1-250			64	111	75	61

¹ Produced before 1922 and registered as standard varieties. All others are registered as improved varieties.

² Earl Champion (Reg. No. 10) was a "bulk" of selections from 2 varieties. Including 8 "side" oats: 4 of hybrid origin.

³ Including James (Reg. No. 155), a hull-less oat.

⁴ Including Cimarron (Reg. No. 134), a bulk of several hybrid-derived selections.

⁵ Including Victory (Reg. No. 232), long overlooked in registration of standard varieties.

⁶ "Multilines" resulting from bulking numerous hybrid lines. Each multiline bulk differs somewhat.

OAT PRODUCTION AREAS OF THE UNITED STATES

Oat production areas of the United States are indicated in figure 23.

Fall-sown oats are grown throughout Southern United States and along the Pacific Coast. Some are grown in Southwestern Canada and in areas adjacent to the coastal area of the State of Washington. In addition, fall-sown oats are grown from the border between United States and Mexico southward well into Mexico. Just how far south they extend is determined somewhat by the elevation.

Spring-sown oats have over the past three centuries become more important in the United States than fall oats, but since fall-sown oats apparently were grown first, they are discussed first in this publication.

Information on oats grown in the United States has been assembled as follows:

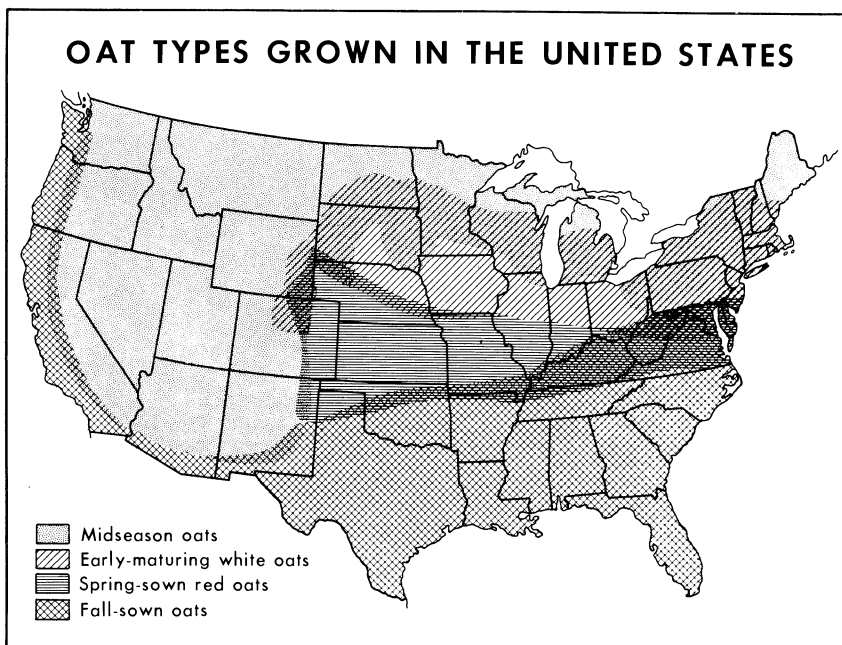


FIGURE 23.—Oat production areas or oat types grown in the United States.

- Fall-sown oats:
 - Registered¹ (progenitor and improved)
 - Not registered
- Spring-grown oats:
 - Spreading panicle varieties:
 - Registered¹ (progenitor and improved)
 - Not registered
 - Side panicle varieties:
 - Registered and not registered²
 - Naked (hull-less) varieties:
 - Registered and not registered²
- Germ-plasm (G.P.) oats
- Fall sown and spring sown
- (To date, 4 have been registered)

¹ Registered by the American Society of Agronomy.

² Only a small number of such are included; hence, they are grouped together.

FALL-SOWN OATS IN THE UNITED STATES

Oats as an agricultural crop very likely were fall sown before becoming a spring-sown crop. This was true both in Europe and in the United States. Spring-sown oats frequently have been selected as mutations from fall-sown oats. The reverse is almost unknown.

In America, and especially in the United States, the old progenitor variety Red Rustproof was fall sown in the Southern United States long before several important spring types were selected from it, which were grown in areas farther north.

Progenitor or standard varieties were established in the early 1920's. They are listed in table 2.

Information on improved fall-sown oats is presented in two parts: (1) Varieties registered by the American Society of Agronomy (table 3) and (2) varieties not registered (table 4).

Information on origin of the registered varieties appears in the order of registration numbers of those varieties, while that on varieties not registered is listed in alphabetical order according to variety name.

Varietal registration activities were started by the American Society of Agronomy and the Department more than a half century ago. To date, some 76 fall-sown oats have been registered. Spikelets and florets of a few of the important registered varieties of fall-sown oats are shown in figure 24, page 106.

TABLE 2.—*History of old progenitor or standard registered fall-sown oat varieties in the United States (in order of registration number)*

Variety	C.I. No.	Reg. No.	Year selected, introduced, or named	Individual or agency that produced or released variety	Source	Parental oat or original geographic source
Burt -----	'293	1	1878 ²	Apparently named for producer, a farmer named Burt.	Ala.	Selected from Red Rust-proof.
Coast Black -----	1025	2	1922	Named by George W. Hendry, California University.	Calif.	Possibly Mexico or Spain.
Fulghum -----	'708	3	1892	J. A. Fulghum. Named by farmer-producer, Warrington, Ga.	Ga.	Selected from Red Rust-proof.
Red Rustproof -----	'1079	4	1848 ²	Merriam. Released by Ga. or S.C. farmer as "Red Mexican Rust Proof." ³	S.C.	Possibly Spain, via Mexico and S.W. United States.
Culberson -----	273	10	1900 ²	Culberson. Presumably a mass selection made in South by farmer named Culberson. ⁴	Tenn. or N.C.	Selected from Red Rust-proof.

Winter Turf	-----	'1570	34	1764 ²	E. A. Coffman is credited with the information that George Washington seeded winter oats at Mt. Vernon that he received from England.	Va.	England, presumably.
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¹ Has additional names and C.I. numbers, Stanton (1955).
² Approximate date only.
³ Coffman, F. A. and others (1961); Coffman (1965), information from U. R. Gore, Experiment, Ga.
⁴ Information received from C. A. Moores, Knoxville, Tenn., about 1930.

TABLE 3.—*History of improved registered fall-sown oat varieties in the United States*

Variety	C.I. No.	Reg. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Tech	947	63	1908(S)	T. B. Hutcheson	Culberson	1924	Va.	T. B. Hutcheson.
Lee	2042	64	1916(C)	T. R. Stanton	Winter Turf × Aurora.	1925	Va.	T. R. Stanton, J. W. Taylor.
Frazier	2381	65	1918(S)	A. H. Leidigh	Selected from Red Rustproof.	1927	Tex.	A. H. Leidigh, P. B. Dunkle.
Nortex	2382	67	1920(S)	A. H. Leidigh	Selected from Red Rustproof.	1920	Tex.	A. H. Leidigh, C. H. McDowell, P. B. Dunkle.
Support	3180	83	1926(S)	H. A. Schoth	Winter Turf (possibly a hybrid).	1931	Oreg.	H. A. Schoth, C. C. Ruth, E. N. Bressman.
Fulwin	3168	90	1930(S)	N. I. Hancock	Fulghum, reselection from Pentagon, C.I. 2499.	1934	Tenn.	N. I. Hancock, T. R. Stanton.
Tennex	3169	91	1930(S)	N. I. Hancock	Fulghum reselected from Pentagon, C.I. 2499.	1940	Tenn.	N. I. Hancock, T. R. Stanton.
Fultex	3531	92	1930(C)	F. A. Coffman	Fulghum × Victoria	1940	Tex.	I. M. Atkins, F. A. Coffman, P. B. Dunkle, H. B. Humphrey.

Ranger	-----	3417	94	1930(C)	F. A. Coffman	Nortex × Victoria	--	1941	Tex.	F. A. Coffman, P. C. Manglesdorf, E. S. McFadden, I. M. Atkins, H. B. Humphrey.
Rustler	-----	3754	95	1930(C)	F. A. Coffman	Nortex × Victoria	--	1941	Tex.	F. A. Coffman, P. C. Manglesdorf, E. S. McFadden, I. M. Atkins, H. B. Humphrey.
DeSoto	-----	3923	101	1931(C)	T. R. Stanton	Lee × Victoria	----	1942	Ark.	C. R. Adair, T. R. Stanton, F. A. Coffman, H. Stevens, H. C. Murphy, H. B. Humphrey.
Forkeddeer	----	3170	110	1930(S)	N. I. Hancock	Fulghum reselected from Pentagon, C.I.		1939	Tenn.	N. I. Hancock, T. R. Stanton.
Mustang	----	4660	120	1936(C)	F. A. Coffman	Fulwin 2× Lee × Victoria.		1950	Tex.	I. M. Atkins, F. A. Coffman, H. C. Murphy, T. R. Stanton, H. B. Humphrey, H. Stevens, H. A. Rodenhiser.
Wintok	-----	3424	121	1926(C)	W. D. Mankin	Hairy Culberson × Winter Fulghum.		1940	Okla.	C. B. Cross, T. R. Stanton, W. D. Mankin, F. A. Coffman, W. M. Osborn.

See footnotes at end of table.

TABLE 3.—*History of improved registered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Reg. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Arlington	----	4657	122	1937(C) F. A. Coffman	Lee × Victoria 2× Fulwin.	1948	Ga., N.C., Va.	F. A. Coffman, G. K. Middleton, R. P. Bledsoe, U. R. Gore, E. Shulkum, H. A. Rodenhiser, T. R. Stanton, H. Stevens.
Atlantic	-----	4599	123	1937(C) F. A. Coffman	Lee × Victoria 2× Fulwin.	1948	Ga., N.C., Va.	F. A. Coffman, G. K. Middleton, R. P. Bledsoe, U. R. Gore, E. Shulkum, H. A. Rodenhiser, T. R. Stanton, H. Stevens.
Letoria	-----	3392	124	1931(C) T. R. Stanton	Lee × Victoria	----	N.C.	T. R. Stanton, G. K. Middleton, J. W. Hendricks, G. M. Reed, H. C. Murphy, H. B. Humphrey, F. A. Coffman, J. W. Taylor, H. Stevens.
LeConte	-----	5107	129	1938(C) N. I. Hancock	Bond × Tennex	----	Tenn.	N. I. Hancock.
Taggart	-----	4652	130	1933(C) T. R. Stanton	Fulghum × Bond	--	Ark.	C. R. Adair, F. A. Coffman, T. R. Stanton, H. B. Humphrey.

Southland ----	5207	131	1941(C)	H. C. Murphy	Richland × Green Russian 2× Bond 3× Fultex.	1950 Fla.	W. H. Chapman, J. D. Warner, H. C. Murphy, H. Stevens.
Delair -----	4653	132	1933(C)	T. R. Stanton	Fulghum × Bond --	1949 Miss.	C. R. Adair, F. A. Coff- man, T. R. Stanton, D. H. Bowman, H. B. Hum- phrey.
Alamo -----	5371	133	1941(C)	H. C. Murphy	Victoria 2× Hajira × Banner 3× Fulghum × Victoria.	1953 Tex.	I. M. Atkins, G. M. Rivers, H. C. Murphy, H. Ste- vens.
Cimarron ----	5106	134	1946(S)	A. M. Schlehuber	Parents unknown. Hardy oat selections bulked.	1954 Okla.	A. M. Schlehuber and others.
Seminole ----	5924	135	1947(C)	F. A. Coffman	Appler 2× Clinton ² × Santa Fe.	1953 Fla.	D. D. Morey, F. A. Coff- man, W. H. Chapman, R. W. Earhart, H. C. Mur- phy.
Floriland ----	6588	136	1947(C)	F. A. Coffman	Bond × Fulghum 2× Landhafer.	1952 Fla.	W. H. Chapman, F. A. Coffman, D. D. Morey, A. T. Wallace, R. W. Ear- hart, H. Stevens.
Victorgrain 48-93.	5355	137	1946(S)	G. J. Wilds	Victoria × Fulgrain	1950 S.C.	G. J. Wilds.

See footnotes at end of table.

TABLE 3.—*History of improved registered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Reg. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Indio -----	7292	138	1953(S)	C. A. Suneson	Victoria × Richland 2 × Fulghum 3 × Palestine. ²	1956	Calif.	C. A. Suneson.
Palestine ----	2328	139	1926(R)	-----	Introduced from Research Farm Werribee, Victoria, Australia.	1940	Calif.	C. A. Suneson, G. A. Wiebe, G. S. Gordan.
Crater -----	7295	142	1926(C)	T. R. Stanton	Fulghum × Custis ²	1956	Oreg.	W. H. Foote, T. R. Stanton.
Dubois -----	6572	149	1940(C)	R. M. Caldwell and others.	Clinton × Forkedeer	1952	Ind.	R. M. Caldwell, L. E. Compton, J. F. Schafer, F. L. Patterson.
Mid-South ----	6977	150	1952(S)	S. S. Ivanoff	Victorgrain 48-93, C.I. 7125. ³	1957	Miss.	S. S. Ivanoff.
Suregrain ----	7155	153	1949(C)	S. J. Hadden	Arlington × Delair 2 × Trispernia.	1957	S.C.	S. J. Hadden, H. F. Harrison, D. L. Allen, T. R. Stanton.

Arkwin -----	5850	157	1936(C)	H. R. Rosen	Winter Fulghum 2× Bond × logold.	1952	Ark.	H. R. Rosen, L. M. Weet- man.
Ferguson 560 --	7161	158	1953(S)	R. L. Thurman	Reselection from Ferguson 922, which was selected from Red Rustproof.	1956	Ark.	R. L. Thurman, D. A. Hinkle.
Moregrain ----	7229	165	1953(C)	S. J. Hadden	Arlington × Delair 2× Trispemia 3× Bond × Fulghum 2× Victorgrain.	1958	S.C.	S. J. Hadden, H. F. Harri- son, D. L. Allen, T. R. Stanton.
Curt -----	7424	169	1948(C)	C. A. Suneson	Nullisomic from Vic- toria × Richland 2× Red Rustproof × Palestine crossed to Kanota. ²	1959	Calif.	C. A. Suneson.
Bronco -----	6571	171	1936(C)	F. A. Coffman	Lee × Victoria 2× Fulwin.	1956	Tex.	I. M. Atkins, F. A. Coff- man, H. C. Murphy, T. R. Stanton, H. B. Hum- phrey, H. Stevens, H. A. Rodenhiser.
AB 110 -----	7148	173	1951(C)	D. D. Morey	Hajira × Joannette 2× Bond × Rain- bow 3× Santa Fe 4× Southland.	1957	Ga.	H. K. Hayes, W. H. Chap- man, R. W. Earhart, H. Stevens, Roy Stroschein.

See footnotes at end of table.

TABLE 3.—*History of improved registered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Reg. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder	
Alamo-X	----	7648	174	1953 ⁴	-----	Alamo (irradiated)	--	1960 Tex.	I. M. Atkins, M. C. Futrell, P. E. Pawlisch.
Blount	-----	7769	175	1946(C)	N. I. Hancock	LeConte × Ful-grain-6 2 × Santa Fe.	-----	Tenn.	N. I. Hancock.
Radar I	-----	7339	177	1952(C)	S. J. Hadden	Victorgrain 48-93 4 × Bond × Rainbow 2 × Hajira × Joannette 3 × Landhafer.	1958	Ga.	D. D. Morey, S. J. Hadden, W. H. Chapman, H. H. Luke, U. R. Gore, A. R. Brown, R. W. Earhart, A. T. Wallace, H. C. Murphy, F. A. Coffman.
Radar II	----	7340	178	1952(C)	S. J. Hadden	Victorgrain 48-93 4 × Bond × Rainbow 2 × Hajira × Joannette 3 × Landhafer.	1959	Ga.	D. D. Morey, S. J. Hadden, W. H. Chapman, H. H. Luke, U. R. Gore, A. R. Brown, R. W. Earhart, A. T. Wallace, H. C. Murphy, F. A. Coffman.
Carolee	-----	7513	180	1947(C)	F. A. Coffman	Letoria 2 × Clinton ² × Santa Fe.	1960	N.C.	W. H. Davis, G. K. Middleton, T. T. Hebert, C. F. Murphy.

Ora -----	7976	195	1957(C)	R. L. Thurman	Lee × Victoria 2× Fulwin 3× Bonda 4× Landhafer 5× Moregrain.	1963	Ark.	R. L. Thurman, J. P. Jones.
Florad -----	7420	204	1954 ^a	-----	Floriland (irradiated)	1960	Fla.	D. T. Sechler, W. H. Chap- man, H. H. Luke.
Florida 500 --	8023	205	1959(C)	W. H. Chapman	Florad 5× Fulgrain- 3 × Suregrain 4× Victorgrain ² 2× Bond × Fulghum 3× Suregrain.	1965	Fla.	W. H. Chapman, H. H. Luke.
Roanoke ----	7413	206	1953(C)	F. A. Coffman	Arlington 3× Win- tok 2× Clinton ² × Santa Fe.	1962	N.C., Va.	T. M. Starling, F. A. Coff- man, T. T. Hebert, U. R. Gore.
Fairfax -----	7417	207	1953(C)	F. A. Coffman	Arlington 3× Win- tok 2× Clinton ² × Santa Fe.	1962	Ga.	U. R. Gore, F. A. Coff- man, T. M. Starling.
Jefferson ----	7624	208	1953(C)	F. A. Coffman	Arlington 3× Win- tok 2× Clinton ² × Santa Fe.	1965	Ga.	D. D. Morey, F. A. Coff- man, U. R. Gore.
Mesa -----	8277	209	-----	C. A. Suneson	Kanota × <i>A. fatua</i>	1966	Ariz.	R. K. Thompson, R. T. Ra- mage, C. A. Suneson.

See footnotes at end of table.

TABLE 3.—*History of improved registered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Reg. No.	Year received, last cross made or selected ¹	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Rapida -----	8303	212	1958(C)	C. A. Suneson	1966	Calif.	C. A. Suneson.
				<i>A. fatua</i> × Palestine Monosomic 2× <i>A. fatua</i> .			
Sierra -----	7706	213	1947(C)	C. A. Suneson	1961	Calif.	C. A. Suneson.
				Kanota (monosomic) × <i>A. fatua</i> .			
Houston -----	7912	219	1954(C)	I. M. Atkins	1964	Texas	I. M. Atkins, M. J. Norris, P. E. Pawlisch.
				Fulwin 2× Lee × Victoria 3× Red Rustproof 4× Victoria × Richland 5× Bond × Rainbow 2× Hajira × Joannette 3× Landhafer.			
Nora -----	8163	222	1957(C)	R. L. Thurman	1966	Ark.	R. L. Thurman, R. L. Smith, J. P. Jones, H. R. Rosen, F. A. Coffman.
				Lee × Victoria 2× Fulwin 3× Bonda 4× Landhafer 5× Moregrain.			
Pennlan -----	7881	223	1956(C)	F. A. Coffman	1968	Pa.	H. G. Marshall, F. A. Coffman.
				Ballard 6× Landhafer × Clinton ⁴ 5× Osage 3× Bonda 2× Hajira × Joannette 4× Santa Fe.			

Compact	-----	8280	225	1958(C)	V. C. Finkner	Kyko × Grey Winter 2× Bountiful × Grey Winter 3× Du- bois.	1968	Ky.	V. C. Finkner, J. C. Wil- liams, D. L. Davis, J. W. Wyles.
Montezuma	--	8419	226	1965(S)	C. A. Suneson	<i>A. byzantina</i> × <i>A. fa- tua</i> bulk.	1969	Calif.	C. A. Suneson, C. O. Qual- set, J. D. Prato, J. T. Feather, W. H. Iaom.
Yancey	-----	8420	228	1962(S)	C. F. Murphy	Carolee × Fulgrain	1968	N.C.	C. F. Murphy.
Coronado	----	8260	230	1961(C)	I. M. Atkins	Santa Fe × Clinton ² 3× Sac 2× Hajira × Joanette 4× New Nortex × Landhafer 5× Black Mesdag × AB 101. ⁵	1967	Tex.	I. M. Atkins, M. E. Mc- Daniel, P. E. Pawlisch.
Cortez	-----	8421	231	1961(C)	I. M. Atkins	Santa Fe × Clinton ² 3× Sac 2× Hajira × Joanette 4× New Nortex × Landhafer 5× Black Mesdag × AB 101. ⁵	1968	Tex.	I. M. Atkins, M. E. Mc- Daniel, P. E. Pawlisch.
Sumter	-----	7509	233	1957(S)	F. A. Coffman	Arlington 3× Win- tok 2× Clinton ² × Santa Fe.	1961	S.C.	W. D. Graham, Jr., W. P. Byrd, E. B. Eskew, G. C. Kingsland.
Sumter 3	----	7886	234	1959(S)	W. P. Byrd	Reselection from Sumter, C.I. 7509.	1966	S.C.	W. D. Graham, Jr., W. P. Byrd, E. B. Eskew, G. C. Kingsland.

See footnotes at end of table.

TABLE 3.—*History of improved registered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Reg. No.	Year received, last cross made or selected ¹	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Bruce -----	7888	235	1956(C)	W. H. Chapman Arlington × Delair 2× Trispermia 3× Arlington.	1966	S.C.	W. D. Graham, Jr., W. P. Byrd, E. B. Eskew, G. C. Kingsland.
Arlington 23	7890	236	1960(S)	W. P. Byrd Reselected from Arlington, C.I. 4657.	1965	S.C.	W. D. Graham, Jr., W. P. Byrd, E. B. Eskew, G. C. Kingsland.
Walken -----	8205	238	1960(C)	V. C. Finkner Kyko × Grey Winter 2× Bountiful × Grey Winter 3× Traveler-1 × Bicknell.	1970	Ky.	V. C. Finkner, D. L. Davis, C. R. Tutt, J. T. Greene.
Checota -----	8311	240	1953(C)	F. A. Coffman Arlington × Wintok	1969	Okla.	L. H. Edwards, E. L. Smith, H. Pass, C. L. Evans.
Chilocco -----	8183	241	1955(C)	A. M. Schlehuber Wintok Early Selection × LeConte.	1970	Okla.	L. H. Edwards, E. L. Smith, H. Pass, C. L. Evans.

Elan -----	8443	248	1962(C)	D. D. Morey	Suregrain 5× Land- hafer 3× Mindo 2× Hajira × Joannette 4× Andrew 6× Coker 57-11 7× Florida 500.	1970	Ga.	D. D. Morey, A. R. Brown, M. J. Bitzer.
Lane -----	8435	250	1952(C)	-----	Grey Winter × Leto- ria.	1969	Oreg.	W. H. Foote, W. E. Kron- stad.
Windsor -----	9140	254	1955(C)	-----	Victorgrain 48-93 × Cimarron.	1971	Va.	T. M. Starling, C. W. Roane, J. M. Camper, Jr., and F. A. Coffman.

¹ R = received; S = selected; C = last cross made.

² Custis is a sister selection to Lee.

³ *Helminthosporium victorinae* resistant reselection from Victorgrain 48-93.

⁴ Year irradiated.

⁵ In a previous publication, AB 101 was included as the last parent. In the registration articles for 230 and 231, the varietal name Ascencao, C.I. 7650, was substituted for AB 101. C.I. files show that C.I. 7650 was assigned to a Black Mesdag × AB 101 derivative.

TABLE 4.—*History of improved nonregistered fall-sown oat varieties in the United States*

Variety	C.I. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Alber	2766	1929(R)	Alberto Boerger	Presumably selected from Red Algerian.	-----	La.	Jose M. Scasso, Argentina, Alberto Boerger, Uruguay.
Almeria	606	1909(R)	A. Ramirez	Introduced from Spain	-----	-----	Received from A. Ramirez, Madrid, Spain.
Anderson	4651	1946(R)	S. J. Hadden	Fulghum × Victoria 2 × "Old" Fulgrain.	About 1946.	S.C.	S. J. Hadden, Marett Farm & Seed Co., Westminster, S.C.
Appler	1815	1920(R)	J. E. Appler	Selected from Red Rust-proof.	About 1920.	Ga.	J. E. Appler, Georgia farmer.
Ascencao	7146	1949(R)	Jose Mattos	Introduced from Brazil	-----	-----	Received from Jose Mattos, Rio Grande do Sul, Brazil.
Aurora	831	1909(S)	C. W. Warburton	Selected from Red Rust-proof (Appler).	1914	Miss.	C. W. Warburton.
Awnless Culred	2676	1925(R)	H. H. Love	Introduced from Southern Europe.	-----	N.Y.	Mediterranean Region, Southern Europe.

Ballard	6980	1945(S)	L. M. Josephson	Selected from Pentagon	Ky., Pa.	L. M. Josephson, D. A. Reid, C. S. Bryner. Selected at Univ. of Ky. and sent to State College, Pa.
Bicknell	3218	1915(S)	T. R. Stanton	Selected from oat received from Argentina.	Va.	Received from F. W. Bicknell, who obtained it in Argentina.
Black Algerian	3215	1903(R)	L. Trabut	Selected from Red Algerian.		Introduced from Algiers, Africa.
Bond	2733	1929(R)	T. R. Stanton	<i>A. sterilis</i> × Golden Rain.		Received from H. Wenholtz, Dept. of Agr., New South Wales, Australia.
Boswell	480	1905(R)	Stephen Boswell	Introduced from England.	Utah	Received from Stephen Boswell, a farmer from Nephi, Utah.
Calcutta	794	1906(R)	Hugh Pye	Introduced from Australia.	Calif.	Received from Dookie, Victoria, Australia. Originally from India by way of Algeria and Australia.
California Red	1026			Type of Red Rustproof grown in California.		Probably introduced into Mexico and from there into California by Spanish Padres.

See footnotes at end of table.

TABLE 4.—*History of improved nonregistered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Camellia	----- 4079	1933(C)	T. R. Stanton	Bond × Alber	----- 1942	La.	J. P. Gray, T. R. Stanton, H. C. Murphy, F. A. Coffman.
Capa (Pampa)	-- 2765	1929(R)	Jose M. Scasso	Selected from oats of Uruguay.	-----	-----	Received from Jose Scasso, Argentina.
Carolina Red	-- 4313	1930(C)	F. A. Coffman	Nortex × Victoria	---- 1944	S.C.	F. A. Coffman, S. J. Had-den.
Ceirch du Bach	2923	1928(S)	E. T. Jones	Selected from old Ceirch du Bach variety.	-----	-----	Scotland.
Century	----- 8351	---(C)	F. A. Coffman	Wintok 2 × Clinton ² × Santa Fe 3 × Lee × Victoria 2 × Fulwin 4 × Clinton ² × Santa Fe.	1969	S.C.	W. D. Graham, Jr., W. P. Byrd, E. B. Eskew, G. C. Kingsland.
Cleo	----- 6740	1947(S)	F. A. Coffman	Wintok 2 × Clinton ² × Santa Fe.	-----	Ga., Fla.	F. A. Coffman, D. D. Morey.
Colwin	----- 5118	1947(S)	F. A. Coffman	Colo × Wintok	-----	Va.	F. A. Coffman, T. M. Starling.

Coy -----	4600	1937(C)	F. A. Coffman	Lee × Victoria 2 × Fulwin.	1950	Va.	F. A. Coffman, E. Shulkum, T. R. Stanton, H. A. Rodenhiser, J. W. Taylor, Harland Stevens, distributed by a seed company, Richmond, Va.
Culred -----	3217	1905(C)	J. B. Norton	Red Rustproof × Culberson.	-----	Va.	Cross by J. B. Norton, selected by T. R. Stanton.
Delta Red 88 --	4220	1943(R)	-----	Synonym for Red Rustproof.	-----	Miss.	Delta Branch Experiment Station, Stoneville, Miss.
Dwarf Culberson.	748	1908(R)	C. A. Moores	Selected from Culberson	-----	Tenn.	Tennessee Agr. Expt. Sta., Knoxville, Tenn.
Earlygrain ----	7708	1961(R)	Wood & Sons	Parents unknown	-----	Va.	Distributed by T. W. Wood & Sons Seed Merchants, Richmond, Va.
Early Wintok --	5849	1950(R)	A. M. Schlehuber	Selected from Wintok	-----	Okla.	A. M. Schlehuber, Okla. Agr. Expt. Sta., Stillwater, Okla.
Excel -----	7603	1960(R)	Joseph Danne	Parents unknown	-----	Okla.	Joseph Danne, private plant breeder.
Florida 167 ----	4320	1936(C)	J. P. Camp	Bond × Fulghum	-----	Fla.	J. P. Camp.

See footnotes at end of table.

TABLE 4.—*History of improved nonregistered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Florida 501	8226	1959(C)	W. H. Chapman	Florad 5× Fulgrain-3 × Suregrain 4× Victor-grain ² 2× Bond × Fulghum 3× Suregrain.	1967	Fla.	D. T. Sechler, W. H. Chapman, H. H. Luke.
Florilee	4060	1935(S)	J. D. Warner	Lee × Victoria	1943	Fla.	J. D. Warner, T. R. Stanton, F. A. Coffman, H. Stevens, H. C. Murphy, H. B. Humphrey.
Forager	7136	1947(C)	F. A. Coffman	Fulwin 2× Lee × Victoria 3× Bond × Anthony 4× Landhafer.	1965	Miss.	S. S. Ivanoff, F. A. Coffman, P. G. Rothman, D. H. Bowman.
Fullbright	5126	1948(R)		Richland × Green Russian 2× Bond 3× Ful-tex.	About 1950.	S.C.	Coker's Pedigreed Seed Co.
Fulmer	3216	1924(S)	T. R. Stanton	Selected from Cassell			T. R. Stanton.
Fulwood	6584	1947(S)	T. W. Wood	Selected from Fulgrain		Va.	T. W. Wood & Sons, Richmond, Va.

Golden	-----	6760	1949(S)	D. D. Morey	Hancock 2× Monota × Bond 3× Fultex Sel.	-----	Fla.	D. D. Morey, R. W. Earhart.
Hairy Culberson	2505	1920(S)	T. R. Stanton	Selected from Culberson	-----	Va.		C. W. Warburton, T. R. Stanton.
Hajira	-----	1001	1919(R)	-----	Collected from El-Hajira, city in Algeria.	-----		Received from Johannesburg, South Africa by USDA.
Kareela	-----	2774	1919(R)	H. Wenholz	Selected from Fulghum	-----		Received by USDA from New South Wales, Australia.
Landhafer	-----	3522	1938(R)	H. C. Murphy	Probably a strain of Red Algerian.	-----		Received by H. C. Murphy from W. Straib of Germany.
Lemont	-----	4080	1926(C)	T. R. Stanton	Lee × Fulghum	-----	About 1941.	G. K. Middleton, T. R. Stanton.
Navarro	-----	966	1919(R)	A. M. Ferguson	Presumably selected from Red Rustproof.		Tex.	Obtained from A. M. Ferguson, Ferguson Seed Farms, Sherman, Tex.
Norline	-----	6903	1950(S)	R. M. Caldwell and others.	Lee × Victoria 2× Forkeddeer ² .		Ind., N.J.	R. M. Caldwell, L. E. Compton, F. L. Patterson, J. F. Schafer.
Norwin	-----	8018	1950(C)	F. A. Coffman	Colwin 4× Hajira x Joannette 3× Atlantic 2× Clinton × Santa Fe.		Tex.	I. M. Atkins, J. H. Gardenhire, F. A. Coffman.

See footnotes at end of table.

TABLE 4.—*History of improved nonregistered fall-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Nysel	5364	1944(S)	H. H. Love	Cornell No. 1375	-----	N.Y.	H. H. Love, N. F. Jensen, W. T. Craig.
Pentagon	2499	1920(S)	T. R. Stanton	Selected from Fulghum	-----	Va.	T. R. Stanton, F. A. Coffman, J. W. Taylor.
Pioneer	3427	1926(C)	W. D. Mankin	Fulghum × Winter Turf	About 1940.	N.J.	H. B. Sprague, W. D. Mankin, T. R. Stanton.
Quincy Grey	4078	1931(C)	S. J. Hadden	Victoria × Norton 2 × Red Rustproof.	1940	Fla.	J. D. Warner, S. J. Hadden.
Quincy Red (Quincy 1).	4077	1930(C)	F. A. Coffman	Kanota × Victoria	1942	Fla.	J. D. Warner, F. A. Coffman.
Rangler	3733	1930(C)	F. A. Coffman	Nortex × Victoria	1943	Tex.	F. A. Coffman, T. R. Stanton, H. B. Humphrey, J. W. Taylor.
Red Algerian	840	1918(R)	L. Trabut	Native cultivated red oat of Algeria.	-----	-----	Introduced by USDA from Algeria.

Ruakura	-----	2025	1912(S)	A. W. Green	Selected from Argentinian oat.	-----	New Zealand Dept. Agr.
Santa Fe	-----	5844 7006	1945(R)	H. C. Murphy	Selected from Argentinian oat.	-----	José Vallega Inst., Fitotec. Santa Cataline, Argentina, S.A.
Segetal	-----	2137	1924(R)	N. I. Vavilov	Selected as a mixture in <i>Triticum dicoccum</i> .	-----	Bureau of Applied Botany, Genetics, and Plant Breeding, Leningrad, USSR.
Stanton ²	-----	3855	1931(C)	T. R. Stanton	Lee × Victoria	1941	S.C. G. J. Wilds, T. R. Stanton, F. A. Coffman, H. B. Humphrey.
Sterisel	-----	2891	-----	-----	Selected from Cassel	-----	Used by pathologists as stem rust differential.
Sturdy	-----	5117	1938(R)	G. J. Wilds	Victoria × Richland 2 × Norton-2 × Navarro.	1941	S.C. G. J. Wilds, Coker's Pedigreed Seed Co.
Sunland	-----	6600	1947(S)	F. A. Coffman	Fulghum × Landhafer	-----	Fla. D. D. Morey, R. W. Earhart, W. H. Chapman, H. Stevens, F. A. Coffman.
Sunrise	-----	982	-----	-----	Natural cross by Algerian oats.	-----	Longerenong Agricultural College, Victoria, New South Wales.

See footnotes at end of table.

TABLE 4.—*History of improved nonregistered fall-sown oat varieties in the United States—Continued*

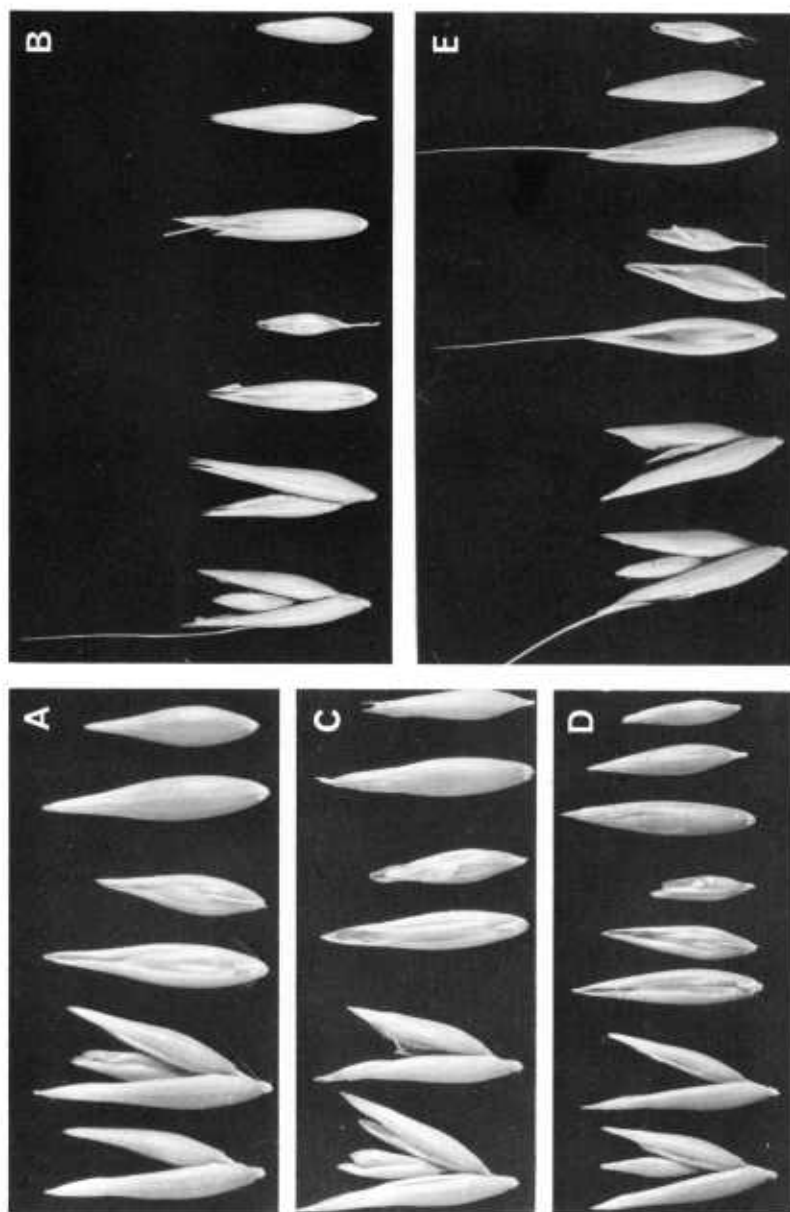
Variety	C.I. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Suwannee	4797			Undetermined origin		Fla.	Presumably a black ke-neled oat selected from Red Rustproof.
Tift	3952	1930(C)	F. A. Coffman	Nortex × Victoria	1940	Ga.	H. S. Garrison, R. P. Bledsoe, F. A. Coffman.
Traveler	4206	1937(C)	H. R. Rosen	Victoria × Custis	1944	Ark.	H. R. Rosen, L. M. Weetman.
Trispermia ³ (and other C.I. No.'s)	7008	1953(S)	M. D. Simons	Selection from Trispermia C.I. 4009.			C.I. 4009 was received from Dominion Rust Lab., Winnipeg, Canada. Originally came from Rumania.
Ukraine	7007	1953(S)	M. D. Simons	Selection from Ukraine C.I. 3259.			C.I. 3259 was introduced by J. G. Dickson of Univ. of Wisc., from Russia in 1930.
Ventura	3989	1935(C)	F. A. Coffman	Victoria × Richland 2 × Fulton.	1943	Calif.	C. A. Suneson, F. A. Coffman.

Verde -----	4312	1934(C)	F. A. Coffman	Red Rustproof ² 2 × Victoria × Richland.	1943	Tex.	E. S. McFadden, F. A. Coffman, H. B. Humphrey, H. Stevens.
Victoria -----	2401	1927(R)	T. R. Stanton	Bulk of three lines originally from Argentina.	-----	-----	E. Klein, Argentina.
Winter Fulghum.	2500	1920(S)	T. R. Stanton	Selected from Fulghum	-----	Va.	T. R. Stanton, F. A. Coffman, J. W. Taylor.
Woodgrain ----	7707	1961(R)	T. W. Wood & Sons	Source unknown (possibly selected from Victor-grain-type oat).	-----	Va.	T. W. Wood & Sons, Richmond, Va.

¹ R=received, C=crossed, S=selected.

² Additional reselections were released.

³ Incorrectly spelled "Trisperma" in some publications.



PN-4099 PN-4100 PN-4201 PN-4202 PN-4203
 FIGURE 24.—Spikelets and florets of improved varieties of fall-sown oats: A, Lee; B, Arlington;
 C, Victorgrain; D, Stanton; E, Fultex.

Registered by the American Society of Agronomy**AB 110 C.I. 7148****Reg. No. 173**

Description.—Juvenile growth upright; culms stout, leaves medium dark, midwide to narrow with slight to no pubescence on sheath or leaves.

Adult plant.—Early; midtall (110–120 cm); culms 2–3, midstout, somewhat reddish in color with slight or no pubescence on sheath above and below nodes; leaf midwide, ligule present, medium dark green, nonpubescent; panicle equilateral, midlong (15–25 cm), and midwide; rachis straight; nodes 5–6, false node absent; branches (10–15) midlong (7–8 cm), straight to raised; spikelets 18–20; glumes red, midlong (21–25 mm), medium coarse in texture; florets 2–3; lemma reddish gray, long (15–18 mm); nerves 7; palea midwide, red or gray; spikelet separation by fracture without basal scar or pubescence; floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium in length and width, nonpubescent; no hairs on lemma.

Alamo C.I. 5371**Reg. No. 133**

Description.—Juvenile growth medium to upright; culms medium stout; few hairs on sheath or leaves; leaf narrow to medium wide, light green.

Adult plant.—Early to medium early; short to midtall (79–129 cm); culms 2–3, stout, few to no pubescence at nodes; leaves intermediate in width, nonpubescent, ligule present, light green in color; panicle equilateral, medium long (21–25 cm), medium wide (10–15 cm); rachis straight; 4 to 6 nodes, false node absent; branches variable in number (20–25), length variable, usually straight to raised; spikelets (20–40); glumes red to light red, midlong (20–25 mm), usually fine in texture; florets 2–4; lemmas red to grayish red, short to medium long (15–18 mm); nerves 7 prominent; palea midwide, gray to red; spikelet separation by fracture, basal scar absent to obscure, basal pubescence absent, floret separation by fracture, distal to heterofracture; awns absent to occasional, straight; kernels plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Alamo-X C.I. 7648**Reg. No. 174**

Description.—Juvenile growth medium to upright; culms medium to stout, pubescence slight on sheath or leaves; leaf medium wide, reddish colored.

Adult plant.—Medium late; short to medium tall (107–120 cm); culms 1–3, medium stout, hairs on nodes absent; leaf medium wide, hairs on leaves and sheath occasional, ligule present; panicle equilateral, medium long (15–25 cm), and medium wide; rachis straight, slightly recurved; 7 nodes, false node absent; branches (14–21) medium in length, straight to raised; spikelets 20–26; glumes yellowish red, long (22–23 mm), medium to coarse in texture; florets 2; lemmas red, short (15–16 mm); nerves 7; palea midwide, red; spikelet separation by fracture, absent to obscure basal scar, basal pubescence sparse, long, floret separation by fracture, hetero; awns numerous, twisted and geniculate; kernels midplump; rachilla segment long and medium slender, nonpubescent; no hairs on lemma.

Arkwin C.I. 5850**Reg. No. 157**

Description.—Juvenile growth very decumbent; culms very stout, color slightly reddish, hairs on sheath very numerous; leaf medium wide, numerous hairs on margins, color medium dark green.

Adult plant.—Late; medium to tall (90–110 cm); 1–4 culms, hairs on nodes absent to few; leaf medium to wide, ligule present, numerous hairs on sheath and leaf margins, plant color medium dark green; panicle equilateral, medium long (15–25 cm), and medium wide; rachis straight; 7–8 nodes, false node absent; branches numerous (21–30), medium long to long, attitude variable, slightly raised to drooping; spikelets 30–40; glumes reddish or pink, long (21–25 mm), coarse in texture; florets 2–3; lemmas light red to reddish, midlong (15–18 mm); nerves 7; palea midwide, light red to reddish yellow; spikelet separation by fracture, basal scar absent to obscure, nonpubescent, floret separation by fracture; awns few to numerous, straight to subgeniculate; kernel midplump; rachilla segment short to medium long, slender to medium stout, nonpubescent; hairs on lemma absent.

Arlington C.I. 4657**Reg. No. 122**

Description.—Juvenile growth semidecumbent to decumbent; culms stout, may be slightly pink, occasional hairs on sheath and leaf margin; leaf medium wide, color medium dark green.

Adult plant.—Medium late; tall (125–145 cm); culms 2–5, medium stout, few hairs above and below nodes; leaf midwide, long, drooping, ligule present, medium dark green in color, pubescence slight on sheath and leaf margins; panicle equilateral, medium to long (16–30 cm), medium to wide; rachis usually slightly flexuous; 6–9 nodes, false node absent; branches (18–22), long (8–15 cm), medium slender, usually very straight to raised to somewhat drooping at ends; spikelets 25–50; glumes light reddish yellow, medium long (18–25 mm), medium coarse in texture; florets 2–3; lemmas very light reddish to slightly gray, midlong (15–17 mm); nerves 7; palea midwide, light yellowish red, often slightly gray; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent to occasional midlong hair, floret separation by basifracture to heterofracture; awns absent to occasional straight or subgeniculate; kernel medium plump; rachilla segment medium long and medium wide, nonpubescent; no hairs on lemma.

Arlington 23 C.I. 7890**Reg. No. 236**

Description.—Juvenile growth decumbent; culms stout, slightly pink; pubescence slight to absent on culm, sheath and leaf margin; leaf medium wide, color medium dark green.

Adult plant.—Midlate to late; tall (150–160 cm); culms 2–3, medium to stout, few hairs on nodes; leaf midwide to narrow, drooping, ligule present, green, some pubescence on sheath and leaf margins; panicle equilateral, long (16–27 cm), midwide; rachis straight to slightly flexuous; 6–9 nodes, false node absent; branches (17–18) medium long (8–14 cm), usually straight to slightly raised; spikelets 26–48; glumes reddish yellow, midlong (18–24 mm) medium to fine in texture; florets 2, sometimes 3; lemma very light reddish to slightly gray, midlong (14–16 mm); nerves 7, obscure; palea midwide, yellowish red; spikelet separation by fracture, base pointed to occasional slight scar, few or no hairs, floret separation by fracture, usually distal; awns usually absent to occasional straight to subgeniculate; kernel midplump to plump; rachilla segment medium in length and width, nonpubescent; no hairs on lemma.

Atlantic C.I. 4599**Reg. No. 123**

Description.—Juvenile growth decumbent; culms stout, pubescence very occasional on sheath; leaf intermediate to narrow, slight or no pubescence on margins, color medium dark green.

Adult plant.—Midlate; tall (100–140 cm); culms 2–4, midstout, pubescence absent above and below node; leaf medium narrow, ligule present, medium dark green, slight or no pubescence on sheath or leaf; panicle equilateral, midlong (10–24 cm), medium wide (12–18 cm); rachis straight to flexuous; 5–8 nodes, false node absent; branches (18–22) medium to long, straight to very drooping; spikelets 23–45; glumes yellow to yellowish red, midlong (22–24 mm), fine to medium in texture; florets 2–3; lemmas midlong (17–19 mm), yellow to yellowish white; nerves 5–7; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent, nonpubescent, floret separation by fracture, usually distal; awns occasional, straight to slightly subgeniculate; kernel midplump; rachilla segment short and midwide, nonpubescent; no hairs on lemma.

Blount C.I. 7769**Reg. No. 175**

Description.—Juvenile growth decumbent; culm stout, occasional long hair on sheath; leaf medium in width and length, no hairs on leaf margins, color medium dark green.

Adult plant.—Medium late; midtall (90–100 cm); culms 3–6, stout, hairs on node long, few above, numerous below; leaf medium wide, ligule present, few hairs on sheath and few on leaf margins; panicle equilateral, often long (15–25 cm) and medium wide; rachis straight to slightly flexuous; 5–7 nodes, false node absent; branches (14–19) straight to raised, medium long (10–15 cm); spikelets 20–31; glumes red to grayish red, midlong (20–24 mm), coarse in texture; florets 2 or 3; lemmas light red, medium long (15–18 mm); nerves 7, prominent; palea very wide, reddish gray; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent, floret separation by heterofracture; awns numerous, straight to twisted, geniculate; kernel very plump; rachilla segment short, medium to wide, nonpubescent; no hairs on lemma.

Bronco C.I. 6571**Reg. No. 171**

Description.—Juvenile growth decumbent; culms stout, pink, pubescence very numerous on culm and sheath; leaf medium wide, medium dark green but often light pink colored, numerous hairs on margins.

Adult plant.—Medium late; midtall (102–137 cm); culms 1–4, stout, pubescence few to numerous above and below nodes; leaf medium narrow, drooping, ligule present, pubescence on sheath and margins variable, numerous, few to absent; panicle equilateral, medium long (15–25 cm), medium to wide; rachis straight to flexuous; 5–7 nodes, false node absent; branches (14–26) short, medium to long, straight to slightly drooping; spikelets 17–32; glumes white to reddish white, midlong (21–25 mm), medium to coarse in texture; florets 2 to 3; lemmas gray to grayish red or gray flecked, medium long (15–18 mm); nerves 5–7; palea midwide, gray or gray flecked white to red; spikelet separation by fracture usually, basal scar absent to obscure, pubescence absent to occasional, floret separation by heterofracture; awns absent to few, straight; kernel midplump to plump; rachilla segment short to medium long, slender to midwide, pubescence absent to occasional, short; no hairs on lemma.

Bruce C.I. 7888**Reg. No. 235**

Description.—Juvenile growth medium upright; culm medium slender; leaf narrow, pubescence few to absent on sheath and leaf margin.

Adult plant.—Medium late; medium tall (124–132 cm); culms 2–3, medium slender, occasional hairs above and below nodes; leaf narrow, ligule present, attitude raised, medium erect to drooping, no hairs on sheath or leaf margin, medium dark green; panicle equilateral, medium long (14–16 cm); rachis slightly flexuous; nodes 7–8, false node absent; branches (20–23) long, straight to raised; spikelets 28–30; glumes very light red, medium long (24–25 mm), medium coarse in texture; florets usually 2; lemma yellow to white, medium short (15–16 mm); nerves 7; palea medium wide, light red; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by heterofracture; awns few, straight; kernel midplump; rachilla segment long (2.25–2.5 mm), medium slender, nonpubescent; no hairs on lemma.

Burt C.I. 293**Reg. No. 1**

Description.—Juvenile growth variable, usually upright; culms variable but usually medium stout, slightly pink, few hairs on sheath; leaf midwide, occasional hairs on leaf margin, color medium light green.

Adult plant.—Characterized by variability (Coffman and others 1925); early to midearly; midtall to tall (119–140 cm); culms 2–6, medium slender, hairs on nodes sparse above and below; leaf medium wide, drooping, ligule present, few or no hairs on sheath or leaf margin; panicle equilateral, medium long (16–20 cm), medium wide (8–10 cm); rachis flexuous; 5–7 nodes, false node absent; branches (10–25), midlong, slender, often drooping; spikelets 14–29; glumes red, slightly red to white, midlong (20–25 mm), medium fine in texture; florets 2–3; lemmas often variable in color but usually red or gray, but occasionally black, long (17–19 mm); nerves 5–7; palea midwide, usually red or gray; spikelet separation variable, usually by fracture to semiabscission, basal scar usually obscure to absent, but sometimes prominent, pubescence variable, numerous short to long to occasional or absent, floret separation usually by heterofracture; awns absent to few, straight to twisted, geniculate; kernel usually midplump; rachilla segment medium long and slender, pubescence usually absent; usually no hairs on lemma.

Carolee C.I. 7513**Reg. No. 180**

Description.—Juvenile growth decumbent; culms stout, some pubescence present on sheath; leaf narrow, pubescence absent, medium dark green.

Adult plant.—Medium late; midtall (112–125 cm); culms 2–4, medium stout, no pubescence above and below nodes; leaf medium wide, ligule present, pubescence few on leaf margins and sheath; panicle equilateral, medium long (15–25 cm) and wide (8–10 cm); rachis flexuous; 6–7 nodes, false node absent; branches (16–20), midlong (10–15 cm), straight to raised; spikelets 20–24; glumes reddish white, long (21–25 mm), medium to coarse in texture; florets 2–3; lemmas very light red, flecked with gray, long (15–16 mm); nerves 7; palea midwide, gray; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence occasional, short, floret separation by heterofracture; awns numerous, straight to subgeniculate; kernel plump; rachilla segment short (1.25–2 mm), medium wide, nonpubescent; no hairs on lemma.

Checota C.I. 8311**Reg. No. 240**

Description.—Juvenile growth medium decumbent, culm mid-stout; slight or no pubescence on sheath or leaf, leaf midwide, medium dark green.

Adult plant.—Midearly; midshort (90–95 cm); culms 4–5, mid-stout; nodal pubescence slight to absent; leaf midwide, ligule present, medium dark green, nonpubescent; panicle midlong (15–22 cm), midwide; rachis straight to flexuous, recurved at tip; nodes 6–7, false node absent; branches 12–18, midlong (13–20 cm), straight to raised or drooping; spikelets 16–20; glumes light grayish red, midlong (23–25 mm), medium coarse in texture; florets 2; lemma medium light red, midlong (16–17 mm); nerves 7, very obscure; palea midwide, reddish yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence usually absent; floret separation by heterofracture; awns very occasional, twisted, geniculate; kernel very plump; rachilla segment very short (1.5–1.75 mm), wide, nonpubescent; no hairs on back of lemma.

Chilocco C.I. 8183**Reg. No. 241**

Description.—Juvenile growth upright; culms medium stout; leaf midwide; pubescence occasional on sheath and lower leaf margins, plant medium dark green.

Adult plant.—Midearly; midtall (90–117 cm); culms 3–4, stout, nodal pubescence occasional above; leaf midwide, medium dark green, ligule present; pubescence few on sheath and lower leaf margin; panicle equilateral, midlong (18–22 cm), midwide (8–11 cm); rachis straight to slightly flexuous; nodes 6–7, false node absent; branches 16–20, midlong (10–14 cm), usually raised in attitude; spikelets 21–35; glumes red, midlong (19–21 mm); texture intermediate; florets 2; lemma yellow, midlong (16–17 mm); nerves 7, obscure; palea midwide, light yellow; spikelet separation by fracture, basal scar absent, basal pubescence occasional and very short; floret separation by fracture, usually distal; awns occasional, straight to subgeniculate; kernel midwide; rachilla segment midlong (1.75–2.25 cm), medium slender, nonpubescent; no hairs on back of lemma.

Cimarron C.I. 5106**Reg. No. 134**

Description.—Juvenile growth very decumbent; culms stout, slight pubescence on sheath and leaf; leaf medium narrow, color medium light green.

Adult plant.—Medium early; usually short (89–102 cm); culms 3–4, stout, pubescence very numerous and long above and below nodes; leaf medium narrow, ligule present, hairs few to numerous on sheath and leaf margins; panicle equilateral, medium long (17–25 cm) and medium to wide; rachis straight to flexuous; 6–7 nodes, false node absent; branches (16–30), midlong (5–8 cm) and medium stout, straight to raised; spikelets 20–40; glumes light red, medium long (21–25 mm), medium coarse in texture; florets 2–3; lemmas gray or gray flecked red, medium long (16–18 mm); nerves usually 5 very prominent; palea midwide, grayish red; spikelet separation usually by fracture, no basal scar or basal pubescence, floret separation by fracture, usually distal; awns occasional, straight; kernel slender to midplump; rachilla segment medium in length, slender, nonpubescent; no hairs on lemma.

This variety has frequently shown a decidedly unusual tendency to produce multiple florets (4–5) in the tip spikelets of the panicle.

Coast Black C.I. 1025**Reg. No. 2**

Description.—Juvenile growth very decumbent; culms stout, hairs on sheath absent; leaf very narrow and pubescent, color green.

Adult plant.—Very late, midtall to tall (110–131 cm); culms 1–3, very stout; pubescence absent on nodes; leaf narrow, ligule present, numerous hairs on sheath and margins of lower leaves, plant color medium light green; panicle equilateral, long (20–30 cm), and wide; rachis slightly flexuous, recurved at tip; 5–6 nodes, false node absent; branches (16–23) short, slender, straight to very drooping; spikelets often numerous 22–45; glumes reddish white, very long (26–32 mm), coarse in texture; florets 3; lemmas black, long (21–22 mm); nerves 7 obscure; palea midwide, black; spikelet separation by abscission, basal scar prominent, basal pubescence numerous, long, floret separation by fracture, basal; awns few to numerous, straight; kernel very plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Compact C.I. 8280**Reg. No. 225**

Description.—Juvenile growth medium decumbent, culm midstout; leaf midwide, medium green; pubescence present on sheath and leaf margin.

Adult plant.—Midlate; short (70–75 cm); culms 3–4, midstout, occasional hairs below nodes; leaf midwide, medium dark green, attitude usually raised, ligule present, numerous long hairs on sheath and leaf margin; panicle equilateral, midlong (14–17 cm); rachis stout; nodes 5–7, false node absent; branches (13–19) midlong (5.5–8.5 cm) usually raised; spikelets 28–37, glumes light red, medium in length (15–22 mm), medium coarse in texture; florets 2, lemma light red, short (10–15 mm); nerves usually 7; palea slightly gray; spikelet separation by fracture; basal scar usually obscure; basal pubescence usually absent to occasional, midlong; floret separation by heterofracture; awns occasional, twisted geniculate or subgeniculate; kernel slender; rachilla segment midwide, midlong, nonpubescent; no hairs on back of lemma.

Coronado C.I. 8260**Reg. No. 230**

Description.—Juvenile growth medium decumbent to decumbent; culm midstout; slight or no pubescence on sheath or leaf margin; leaf midwide, medium dark green.

Adult plant.—Midearly; midshort (83–86 cm); culms 2–4, midstout, nodal pubescence absent; leaf midwide, medium dark green, sheath and leaf nonpubescent; ligule present; panicle midlong (15–18 cm), midwide; rachis straight to flexuous; nodes 5–6, false node absent; branches 12–15, midlong, straight to drooping; spikelets 19–24; glumes red, midlong (20–21 mm), coarse in texture; florets 2; lemma light red, midlong (15–16 mm); nerves 7–9; palea midwide, grayish red; spikelet separation by fracture, basal scar absent to obscure; basal pubescence occasional, long; floret separation by heterofracture, or fracture basal; awns occasional, straight to subgeniculate; kernel very plump; rachilla segment midlong (2–2.25 mm) and midwide, nonpubescent; no hairs on back of lemma.

Cortez C.I. 8421**Reg. No. 231**

Description.—Juvenile growth medium decumbent; culm slender; slight or no pubescence on leaf or sheath; leaf medium wide, medium dark green.

Adult plant.—Very early; short (70–80 cm); culms 5–6, slender; nodes nonpubescent; leaf medium to narrow; ligule present; medium dark green; no pubescence on sheath or leaf; panicle short (12–15 cm), midwide; rachis slender, straight, nodes 5–6, false node absent; branches 8–10, short, slender, straight to raised; spikelets 10–16, glumes reddish, midlong (22–25 mm), coarse in texture; florets 2; lemma light red, midlong (16–18 mm); nerves 7–9, prominent; palea wide, red; spikelet separation by fracture, basal scar absent to very obscure, pubescence occasional, midlong, floret separation by fracture, usually distal; awns absent, kernel very plump; rachilla very short and wide; nonpubescent; no hairs on back of lemma.

Crater C.I. 7295

Reg. No. 142

Description.—Juvenile growth very decumbent; culms medium slender, sheath and culm very pubescent; leaf medium narrow, few hairs on margin, color medium dark green.

Adult plant.—Late; very tall (142–165 cm); culms 2–3, medium stout; hairs on nodes numerous both above and below; leaf midwide, ligule present, hairs numerous on sheath and margin, especially of lower leaves; panicle equilateral, medium long (15–25 cm) and wide (14–18 cm); rachis straight to flexuous; 6–7 nodes, false node absent; branches (17–21) long, drooping or straight to raised; spikelets 24–48; glumes white to yellowish red, midlong (20–23 mm), fine to medium in texture; florets 2–3; lemmas white to dark gray, medium long (16–19 mm); nerves 7 prominent; palea midwide, light gray; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by fracture, distal; awns absent to few, straight; kernel midplump; rachilla segment short, medium to long, medium to slender, nonpubescent; no hairs on lemma.

Culberson C.I. 273

Reg. No. 10

Description.—Juvenile growth very decumbent, culms medium stout, few hairs on sheath; leaf medium wide, few hairs on margins, plant color medium light green.

Adult plant.—Medium late; midtall to tall (117–124 cm); culms 3–5, medium stout, hairs on node absent to few above and below; leaf medium wide and drooping, ligule present, hairs on sheath and leaves absent to few; panicle equilateral, medium to long (17–28 cm) and medium wide; rachis slender, flexuous, usually recurved;

nodes 4-6, false node absent; branches (12-28) long, straight to drooping; spikelets 21-49; glumes white, midlong (20-24 mm), fine in texture; florets 2-3; lemmas usually gray but may be variable, red or even yellow, medium to long (16-21 mm); nerves 7; palea midwide, gray to red; spikelet separation variable, fracture to abscission leaving none to prominent basal scar, basal pubescence few, long, floret separation by fracture, distal or heterofracture; awns occasional, subgeniculate to twisted and geniculate; kernel slender to midplump and long; rachilla segment medium long and medium wide to slender, nonpubescent; no hairs on lemma.

Curt C.I. 7424

Reg. No. 169

Description.—Juvenile growth intermediate to upright; culms medium stout, some pubescence present on sheath; leaf medium wide, some pubescence on leaf margin; color medium green.

Adult plant.—Early to midlate; very short (74-80 cm); culms 2-4 medium stout, nodes pubescent, few to many above, few below; leaf medium wide, medium dark green, ligule present, somewhat pubescent on sheath and leaf margin; panicle equilateral, short to midlong (10-15 cm), intermediate in width; rachis straight to flexuous; nodes 4-6, false node absent; branches (10-14) short (3-3.5 cm), slender, raised, straight to drooping; spikelets 15-19; glumes red to yellowish red, long (24-27 mm), coarse in texture; florets 2-3; lemmas red to grayish red, long (21-23 mm); nerves 7 prominent; palea midwide, gray or grayish red; spikelet separation by abscission, prominent basal scar, basal pubescence few to numerous, long, floret separation mostly by basifracture; awns numerous, usually straight; kernel midplump to plump; rachilla segment medium long and medium wide, pubescence few to numerous, short to medium long; occasional long hair on back of lemma.

Delair C.I. 4653

Reg. No. 132

Description.—Juvenile growth medium upright; culms stout, pink, no hairs on sheath; leaf midwide, hairs occasional to absent on leaf margin; plant color medium dark green.

Adult plant.—Medium early; midtall (91-130 cm); culms 2-5, stout, hairs on node few to numerous above and below; leaf midwide, plant color medium dark green, ligule present, hairs on sheath and leaf usually absent to few; panicle equilateral, short to midlong (10-18 cm), narrow to medium wide; rachis straight to

flexuous; 4-8 nodes, false node absent; branches (12-26) very short, mostly raised in attitude; spikelets 14-35; glumes red, midlong (20-25 mm), medium to coarse in texture; florets usually 2 or 3; lemmas reddish yellow, short (15-16 mm); nerves 7; palea wide, reddish yellow to reddish gray; spikelet separation by fracture to semiabscission, basal scar absent to obscure, pubescence numerous, long, floret separation usually by heterofracture; awns numerous, straight; kernels plump; rachilla segment short to medium in length, slender, nonpubescent usually, occasional very short pubescence; no hairs on lemma.

DeSoto C.I. 3923

Reg. No. 101

Description.—Juvenile growth medium decumbent; culms stout, slightly pink, pubescence few to numerous on culm and sheath; leaf medium wide, numerous long pubescence on leaf margins, leaf color medium dark green.

Adult plant.—Midlate; midtall (117-135 cm), culms 1-5, stout, hairs at node absent; leaf midwide, ligule present, light to medium dark green, few or no hairs on sheath or leaf margins; panicle equilateral, medium long and medium wide; rachis straight to flexuous; nodes 4-6, false node absent; branches (13-22) medium to long, straight to raised; spikelets 19-27; glumes usually white to reddish white, long (22-24 mm), medium in texture; florets usually 2; lemmas usually red to reddish yellow, medium long (15-17 mm); nerves 7; palea midwide, reddish gray to yellow; spikelet separation by fracture, basal scar prominent to obscure, basal pubescence present, long, floret separation by heterofracture; awns few to numerous, straight, subgeniculate to twisted and geniculate; kernel midplump to plump; rachilla segment medium short to very short and medium wide, nonpubescent; hairs on lemma absent.

Dubois C.I. 6572

Reg. No. 149

Description.—Juvenile growth very decumbent; culms very stout, sheath very pubescent; leaf narrow, margins very pubescent and some pubescence on back of leaves; color medium dark green.

Adult plant.—Late; midtall (109-120 cm); culms 1-5 stout, hairs on node absent to numerous above and below; leaf narrow, ligule present, hairs on sheath and leaf absent to few; plant color medium dark green; panicle equilateral, medium long (15-25 cm) and medium wide; rachis straight to flexuous; nodes 4-8; false node absent; branches (9-19) medium to long, straight, raised to

drooping; spikelets 15–26; glumes white, medium long (21–24 mm), fine to medium to coarse in texture; florets usually 2; lemmas yellow, intermediate in length (16–18 mm); nerves 5–7; palea wide, yellow; spikelet separation by fracture, basal scar usually absent to obscure, nonpubescent, floret separation by fracture, distal; awns absent to numerous, straight, subgeniculate to twisted, geniculate; kernels plump; rachilla segment medium long, slender to medium stout, nonpubescent; no hairs on lemma.

Elan C.I. 8443

Reg. No. 248

Description.—Juvenile growth intermediate to decumbent; culm stout; leaf midwide; pubescence absent on sheath and leaf margins; plant medium dark green.

Adult plant.—Midearly; midtall (95–120 cm); culms 2–3, stout; nonpubescent at nodes; leaf midwide, medium dark green, ligule present; pubescence usually absent on sheath and leaf margin; panicle equilateral, long (23–24 cm), midwide (10–14 cm); rachis straight to slightly flexuous, nodes 6–7; false node absent; branches 18–21, midlong (8–10 cm), usually raised in attitude; spikelets 26–36; glumes light red, midlong (22–24 mm), medium coarse in texture; florets 2; lemma light reddish yellow; spikelet separation by fracture; basal scar absent or very obscure; basal pubescence absent; floret separation by heterofracture; awns absent to occasional, straight; kernel midwide, rachilla midlong (1.5–2.0 mm), midwide, nonpubescent; no hairs on back of lemma.

Fairfax C.I. 7417

Reg. No. 207

Description.—Juvenile growth decumbent; culms stout, hairs absent to few on culm and sheath; leaf medium wide, no pubescence on margins; plant color medium dark green.

Adult plant.—Medium late; tall (119–130 cm); culms 2–5 medium stout, hairs on nodes absent; leaf medium wide, medium dark green, ligule present, hairs on sheath and leaves absent; panicle equilateral, medium long (18–22 cm) and narrow to widespread; rachis straight to flexuous; 5–6 nodes, false node absent; branches (19–24), medium long, raised, straight to drooping; spikelets 26–39; glumes white, long (20–24 mm), medium in texture; florets usually 2; lemmas white or gray flecked with white, short to medium (14–16 mm); nerves 5–7 rather prominent; palea midwide, white or gray; spikelet separation by fracture, base pointed, nonpubescent,

floret separation by heterofracture; awns very occasional, straight; kernel midplump to plump; rachilla segment medium wide to slender, few short to medium long hairs present; no hairs on lemma.

Ferguson 560 C.I. 7161

Reg. No. 158

Description.—Juvenile growth very decumbent; culms stout, nonpubescent; leaf medium narrow, nonpubescent, light green.

Adult plant.—Midlate; tall (120–124 cm); culms 2–4 slender, nonpubescent; leaf medium wide, ligule present, hairs on margin very few, color medium light green; panicle equilateral, long (24–26 cm), and medium wide (7–8 cm); rachis slender, recurved; 5–6 nodes, false node absent; branches (15–22), medium long (6–8 cm) slender, usually drooping; spikelets 17–25; glumes red, midlong (23–25 mm), coarse in texture; florets 2; lemmas red, often with gray tips, midlong (17–18 mm); nerves 7; palea midwide, red; spikelets separation by abscission or semiabscission, basal scar on lower floret prominent, basal pubescence numerous, long, floret separation by basifracture or heterofracture; awns numerous, straight; kernel midplump; rachilla segment long and medium slender, occasional short hair present; no hair on lemma.

Florad C.I. 7420

Reg. No. 204

Description.—Juvenile growth decumbent; culms medium stout, few hairs present on sheath; leaf medium wide, nonpubescent; plant color medium light green often with reddish tinge.

Adult plant.—Early; short to midtall (85–108 cm); culms 2–4 stout, hairs on nodes absent to few below; leaf medium wide, ligule present, pubescence on sheath and leaf margins absent to very few, color light green; panicle equilateral, midlong (10–15 cm) and midwide (3–5 cm); rachis straight to slightly flexuous; 5–7 nodes, false node absent; branches (10–16) often raised, long (4–5 cm); spikelets 12–21; glumes reddish white to red, midlong (22–28 mm), coarse in texture; florets 2–3; lemma light red, medium long (15–17 mm); nerves 7; palea medium wide, light red to reddish gray; spikelet separation by fracture, basal scar absent to obscure, pubescence absent to few, floret separation by heterofracture; awns few to numerous, straight to twisted, geniculate; kernel medium to plump; rachilla segment long and wide, nonpubescent; no hairs on lemma.

Florida 500 C.I. 8023**Reg. No. 205**

Description.—Juvenile growth upright; culms medium stout, hairs numerous on sheath; leaf medium narrow, few hairs on leaves, medium light green color.

Adult plant.—Early to medium early; medium short (100–105 cm); culms 2–4, medium stout, hairs on nodes absent; leaf medium wide, light green, ligule present, few long hairs on sheath and leaves; panicle equilateral, short (15–16 cm), and wide (7–8 cm); rachis straight; nodes 6–7, false node absent; branches (22–23), medium long (4–5 cm), straight, raised to drooping; spikelets 27–29; glumes light red, midlong (21–23 mm), coarse in texture; florets 2; lemmas very light red to reddish yellow, medium long (15–16 mm); nerves 5–7; palea midwide, light red to yellowish red; spikelet separation by fracture, basal scar absent to obscure, nonpubescent, floret separation by heterofracture; awns occasional, straight; kernel medium to plump; rachilla segment very slender, long, pubescence short, few to numerous; no hairs on lemma.

Floriland C.I. 6588**Reg. No. 136**

Description.—Juvenile growth intermediate to upright; culm medium stout; pubescence on sheath and leaves few to absent; leaf medium wide to narrow; plant color medium dark green.

Adult plant.—Early; midtall (95–125 cm); culms 4–5, medium stout, pubescence occasional above to numerous below nodes; leaf medium wide, dark green, ligule present, few hairs on sheath or leaf margins; panicle equilateral, short to medium long (15–25 cm) and medium wide (8–11 cm); rachis straight to slightly recurved and flexuous; 4–6 nodes, false node absent; branches (10–25), medium slender, medium to long, straight to drooping; spikelets 14–16; glumes red, long (25–30 mm), coarse in texture; florets 2; lemmas grayish red, medium long (18–21 mm); nerves 7, prominent; palea midwide, gray; spikelet separation by fracture to semiabscission, basal scar obscure to prominent, pubescence numerous, long, floret separation by heterofracture; awns numerous, straight; kernel medium to plump; rachilla segment midlong (2–2.5 mm), nonpubescent; no hairs on lemma.

Forkeddeer C.I. 3170**Reg. No. 110**

Description.—Juvenile growth decumbent to very decumbent; culm stout, hairs extremely numerous on sheath; leaf very narrow, numerous long hairs on margin; plant color green with reddish tinge.

Adult plant.—Late; tall (122–140 cm); culms 2–4 medium stout, few to numerous hairs above and below nodes; leaf midwide, ligule present, hairs on leaves present; panicle equilateral, medium long and medium wide; rachis straight to recurved; nodes 4–7, false node absent; branches (10–22) medium long, straight to drooping; spikelets 18–32; glumes white, very long (22–30 mm), medium coarse in texture; florets 2–3; lemma reddish to gray, long (18–21 mm); nerves 7, very prominent; palea midwide, gray; spikelet separation by fracture, basal scar absent to obscure, nonpubescent, floret separation by heterofracture; awns occasional, straight; kernel medium slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Frazier C.I. 2381 (Frazier Red Rustproof)**Reg. No. 65**

Description.—Juvenile growth usually upright; culm stout, usually no pubescence on sheath or leaf; plant color light green.

Adult plant.—Midearly; medium tall (79–137 cm); culms 2–4 medium stout, slight pubescence below and above node; leaf medium wide, ligule present, drooping, medium dark green, slight to no pubescence on sheath or leaf blade; panicle equilateral, midlong (10–20 cm) narrow to medium wide; rachis straight to recurved; 4–6 nodes, false node absent; branches few to many (10–25) short to medium long; spikelets few to many (20–40); glumes red, midlong (21–25 mm), medium to coarse in texture; florets 2–3; lemma red to grayish red, medium long (15–18 mm); nerves 7; palea usually midwide, grayish red; spikelet separation by abscission to fracture, base pointed, obscure to prominent scar, basal hair absent to few, long, floret separation by fracture, basal to heterofracture; awns few to numerous, straight; kernel midplump; rachilla segment short to medium long and medium to wide, pubescence absent to few, long; no hairs on lemma.

Fulghum C.I. 708**Reg. No. 3**

(Fulghum is characterized morphologically by being variable.)

Description.—Juvenile growth intermediate to decumbent; culm stout, often slightly red, pubescence few to absent on culm and sheath; leaf medium wide, very occasional long hair on margin; plant medium light green.

Adult plant.—Variable, early, midearly to midlate, usually; short to midtall (74–105 cm); culms 2–4, intermediate to stout, occasional hairs above and below node; leaf medium light green, medium wide and drooping, ligule present, hairs on sheath and leaf absent to few; panicle equilateral, variable medium to short (10–15 cm) and medium narrow to wide; rachis straight to recurved, somewhat flexuous; 4–6 nodes, false node absent; branches (9–20) short to midlong, straight, raised to drooping; spikelets 20–30; glumes red, medium long (19–24 mm), medium to coarse in texture; florets usually 2–3; lemma usually red, but may be tinged with gray, medium long (15–19 mm); nerves 5–7; palea midwide, usually red, but often gray; spikelet separation usually by fracture, often with an obscure basal scar, pubescence sparse, long, floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium in length and width, nonpubescent; no hairs on lemma.

Fultex C.I. 3531

Reg. No. 92

Description.—Juvenile growth decumbent; culm medium stout, occasional hairs on sheath; leaf narrow, few to no hairs on leaf margin; plant color medium light green.

Adult plant.—Midearly; short to midtall (94–114 cm); culms 2–3, medium stout and nonpubescent; leaf medium wide, medium dark green; ligule present, pubescence on leaves absent to occasional; panicle equilateral, short to intermediate (10–25 cm) and narrow to intermediate in width; rachis straight to flexuous; 4–6 nodes, false node absent; branches (11–18) short, straight to raised; spikelets 16–30; glumes red, short to medium (18–22 mm), medium to coarse in texture; florets usually 2; lemma reddish gray, midlong (14–17 mm); nerves 7, very prominent; palea midwide, grayish to red; spikelet separation by fracture, basal scar absent to very obscure, basal hairs absent to occasional, long, floret separation by fracture, distal or heterofracture; awns usually absent to very few, straight but occasionally subgeniculate to geniculate; kernel plump; rachilla segment short, wide, nonpubescent; no hairs on lemma.

Fulwin C.I. 3168**Reg. No. 90**

Description.—Juvenile growth very decumbent; culm very stout, very numerous hairs on sheath and leaf margins; leaf narrow, color of culm and leaf medium light green.

Adult plant.—Midlate; tall (117–127 cm); culms 3–5, stout, few to numerous pubescence both above and below node; leaf medium light green, narrow, ligule present, attitude drooping, occasional hairs on sheath and margins; panicle equilateral, medium long (15–20 cm), and medium to wide; rachis straight to recurved; 5–7 nodes, false node absent; branches (15–22), medium slender, long, straight to drooping; spikelets 21–31; glumes white, long (21–25 mm), fine to intermediate in texture; florets 2 or 3; lemma red to grayish red, medium to long (17–20 mm); nerves 5–7; palea mid-wide, usually reddish gray; spikelet separation by fracture to semiabscission, basal scar absent to obscure, pubescence few to absent, floret separation by fracture, usually distal; awns usually few, straight to subgeniculate; kernel midplump to plump; rachilla segment medium long, medium wide to slender, occasionally few hairs present; no hairs on lemma.

Houston C.I. 7912**Reg. No. 219**

Description.—Juvenile growth intermediate; culm stout, pubescence on culm and sheath absent; leaf wide, pubescence absent; plant color somewhat glaucous.

Adult plant.—Midlate; midtall (94–110 cm); culms 3–4 medium stout, hair on nodes absent; leaf wide, ligule present, hairs on leaves absent; panicle equilateral, midlong (16–19 cm) and medium wide; rachis straight to flexuous; 5–6 nodes, false node absent; branches (8–12) short (5–6 cm), raised to somewhat drooping; spikelets 12–15; glumes reddish, midlong (19–20 mm), medium in texture; florets 2; lemma yellowish or very light red, short (12–15 mm); nerves 7, obscure; palea wide, very light red; spikelet separation by fracture, basal scar absent, nonpubescent; floret separation by heterofracture; awns absent; kernel very plump; rachilla segment long and very slender, few midlong hairs present; hairs on lemma absent.

Indio C.I. 7292**Reg. No. 138**

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaf margin; leaf medium wide; plant color medium light green.

Adult plant.—Early; very short (70–85 cm); culms 2–4, medium stout, occasional hair below nodes; leaf medium wide, ligule present, hairs on leaves absent, color of leaf medium light green; panicle equilateral, short to very short (8–13 cm) and medium wide; rachis medium slender, recurved; 3–4 nodes, false node absent; branches (7–14), short to midlong and drooping; spikelets 12–15; glumes reddish, long (23–29 mm), coarse in texture; florets 2–3; lemma red, long (20–22 mm); nerves 7; palea midwide, red to gray flecked; spikelet separation often by abscission, basal scar prominent, occasional to numerous, short to long basal hairs present, floret separation by basifracture to heterofracture; awns numerous, straight; kernel midplump to plump; rachilla segment short and wide, pubescence absent to few, short to long, occasional long hairs on lemma.

Jefferson C.I. 7624**Reg. No. 208**

Description.—Juvenile growth very decumbent; culms medium stout, numerous hairs on sheath and leaves; leaf narrow; plant color medium dark green.

Adult plant.—Late; tall (125–130 cm); culms 2–3 medium stout, hairs on nodes few to absent; leaf medium wide, ligule present, numerous to few hairs on sheath and leaf margins; panicle equilateral, medium long (18–20 cm), midwide (7–8 cm); rachis straight to slightly flexuous; 5–6 nodes, false node absent; branches (15–16) long (5–7 cm), straight to somewhat raised to drooping; spikelets 18–20; glumes yellowish white, medium long (20–21 mm), fine in texture; florets usually 2; lemma yellowish white, short (15–16 mm); nerves 7 very obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, nonpubescent; floret separation by heterofracture; awns usually absent; kernel midplump; rachilla segment long and medium slender, few to numerous medium long hairs present; no hairs on lemma.

Lane C.I. 8435**Reg. No. 250**

Description.—Juvenile growth medium upright; culm midstout; leaf midnarrow, medium light green; leaf and sheath slightly pubescent.

Adult plant.—Midlate; midtall (90–110 cm); culms 4–7, midstout, occasional hairs below nodes; leaf midwide, medium light green, ligule present; attitude straight to drooping; few or no hairs on sheath or leaf margin, panicle equilateral, midlong (14–16 cm); rachis midstout, straight to slightly flexuous; nodes 6–9, false node absent; branches 13–19, midlong (7–8 cm), straight to drooping; spikelets 15–23; glumes light red, midlong (23–25 mm), medium coarse in texture; florets 2; lemma grayish red, midlong (17–18 mm); nerves 7; palea midwide, gray; spikelet separation by fracture; basal scar absent to obscure; basal pubescence few to numerous, midlong; floret separation by heterofracture to fracture distal; awns numerous, twisted geniculate; rachilla segment midlong (2–2.5 mm), midwide, nonpubescent, no hairs on lemma.

LeConte C.I. 5107**Reg. No. 129**

Description.—Juvenile growth decumbent; culm very stout, few to no hairs on sheath or leaf margin; leaf medium wide, color medium dark green.

Adult plant.—Medium late; medium tall (119–137 cm); culms 2–5, very stout; pubescence present below nodes and occasional above; leaf medium wide, ligule present, few hairs present on sheath and leaf margins, color of leaf medium light green; panicle equilateral, medium long (10–18 cm), wide (9–11 cm); rachis straight to flexuous; 5–7 nodes, false node absent; branches (13–22), medium long, straight to raised; spikelets 14–32; glumes red, long (21–24 mm), coarse in texture; florets 2–3; lemma red, flecked with gray, midlong (15–19 mm); nerves 7; palea wide, grayish red; spikelet separation by fracture, basal scar absent to obscure, nonpubescent; floret separation by heterofracture; awns occasional, straight; kernel very plump; rachilla segment very short to medium in length and width, nonpubescent; no hairs on lemma.

Lee C.I. 2042**Reg. No. 64**

Description.—Juvenile growth decumbent; culm very stout, slightly red, hairs very numerous on culm and sheath; leaf narrow, numerous hairs on margin; plant color medium dark green.

Adult plant.—Late; midtall (90–128 cm); culms 3–6, stout, often reddish colored, hairs on node absent to occasional; leaf narrow, medium dark green, ligule present, few hairs on sheath and leaf margin; panicle equilateral, medium long (18–26 cm) and medium wide; rachis medium stout, somewhat flexuous; 5–6 nodes, false node absent; branches (16–20) medium long, medium stout, raised or drooping; spikelets 18–41; glumes white or yellow often tinged with pink, medium long (21–25 mm), medium to fine in texture; florets 2 or 3; lemma yellow, medium long (15–18 mm); nerves 5 to 7 obscure; palea wide, yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional short basal hair present; floret separation by heterofracture; awns occasional, usually straight; kernel very plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Letoria C.I. 3392

Reg. No. 124

Description.—Juvenile growth decumbent; culm stout, very numerous hairs on sheath and leaf margin; leaf very narrow; plant color medium light green.

Adult plant.—Late; midtall (122–132 cm); culms 1–4 stout, pubescence occasional below nodes; leaf narrow, ligule present, occasional pubescence on sheath and leaf margin, color medium light green; panicle equilateral, medium long (13–18 cm) and medium wide; rachis straight to flexuous; 4–6 nodes, false node absent; branches (9–18), medium long, straight to drooping; spikelets 19–29; glumes reddish white, midlong (21–25 mm), coarse in texture; florets 2–3; lemma pinkish yellow to red, medium to long (16–19 mm); nerves 5–7; palea midwide, reddish yellow to red; spikelet separation by fracture, obscure basal scar, numerous basal hairs; floret separation by heterofracture; awns numerous, twisted and geniculate; kernel midplump; rachilla segment short and wide, pubescence occasional, short to medium long; no hairs on lemma.

Mesa C.I. 8277

Reg. No. 209

Description.—Juvenile growth very decumbent; culms medium slender, slightly pink, pubescence few to absent on sheath and leaf margins; leaf narrow, intermediate to drooping, leaf medium dark green but very slightly pink color.

Adult plant.—Early to medium; tall (124–135 cm); culms 2–4, medium slender, numerous hairs below nodes; leaf medium to narrow, medium dark green, ligule present, few hairs on sheath

and leaf margins; panicle equilateral, midlong (19–22 cm); rachis slender, slightly flexuous and recurved; 7 nodes, false node absent; branches (19–20), straight to raised, long (10–13 cm); spikelets 30–32; glumes red, very long (30–33 mm), very coarse in texture; florets 2–3; lemma red, long (21–22 mm), and medium narrow; nerves 7; palea narrow, red; spikelet separation by fracture, basal scar absent to obscure, basal pubescence numerous, long; floret separation usually by basifracture; awns numerous on primary florets, twisted and geniculate; kernel medium slender; rachilla segment medium to long and slender, pubescence few present, medium to long; no hairs on lemma.

Mid-South C.I. 6977

Reg. No. 150

Description.—Juvenile growth decumbent; culms very stout, red, occasional hairs on sheath and few on lower leaf margin; leaf narrow, plant color medium dark green.

Adult plant.—Early to midearly; midtall (107–110 cm); culms 2–5, medium stout, pubescence on nodes usually absent; leaf medium wide, ligule present, hairs present on sheath and leaves; panicle equilateral, medium long (15–17 cm) and wide; rachis medium stout, recurved; 5–6 nodes, false node absent; branches (16–17), midlong (8–12 cm), drooping; spikelets 21–25; glumes red, medium long (24–25 mm), medium in texture; florets 2–3; lemma red, gray flecked, long (19–20 mm), and midwide; nerves 7, very prominent; palea midwide, grayish red; spikelet separation by fracture, obscure basal scar, occasional short to long basal hair present on primary and also second floret; floret separation by heterofracture, occasional long hair at base of second florets; awns few, straight; kernel midplump; rachilla segment long and wide, somewhat pubescent; no hairs on lemma.

Montezuma C.I. 8419

Reg. No. 226

Description.—Juvenile growth upright; culm slender, slight pubescence on sheath and leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; short (60–80 cm); culms 3–6, midslender; nodal pubescence few, very short; leaf midwide, medium dark green, occasional hairs on sheath and margin; ligule present; panicle short (14–15 cm), medium wide; rachis midslender, straight; nodes 5–6, false node absent; branches, few (10–12), short, usually raised; spikelets 12–13, glumes red, long (22–30 mm); coarse in texture; florets 2; lemma grayish red, midlong (17–18 mm);

nerves 7; palea midwide, grayish red; spikelet separation by fracture; basal scar present, obscure, basal pubescence present, medium long; floret separation by heterofracture to basifracture; awns numerous, usually straight; kernel midplump; rachilla midlong and slender; occasional short hair present, no hairs on back lemma.

Moregrain C.I. 7229

Reg. No. 165

Description.—Juvenile growth decumbent; culms midstout, numerous hairs on sheath and few hairs on leaves; leaf midwide, plant color medium dark green, somewhat glaucous.

Adult plant.—Early; short (87–89 cm); culms 1–4 stout, numerous long hairs above and below nodes; leaf medium wide, drooping, very glaucous, ligule present, hairs numerous on sheath and leaf margin; panicle equilateral, short (10–15 cm) medium wide (8–10 cm); rachis straight to slightly flexuous; 6–7 nodes, false node absent; branches (14–17), medium long (7–9 cm), medium stout, straight to raised; spikelets 15–24; glumes red, midlong (20–25 mm), medium coarse in texture; florets 2–3; lemma reddish yellow, medium long (16–18 mm); nerves 7, prominent; palea very wide, reddish yellow; spikelet separation by fracture, basal scar absent to obscure, occasional long basal hair present, floret separation by heterofracture; awns occasional straight; kernel very plump; rachilla segment very short (1–1.5 mm) and very wide, non-pubescent; no hairs on lemma.

Mustang C.I. 4660

Reg. No. 120

Description.—Juvenile growth very decumbent; culm medium stout, often slightly pink; occasional hairs on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midearly; midtall (94–127 cm); culms 1–5, pubescence absent to numerous above and below nodes; leaf medium dark green, medium wide, ligule present, hairs absent to few on sheath and leaf margin; panicle equilateral, medium to long (14–25 cm) and medium wide; rachis straight to flexuous; 4–6 nodes, false node absent; branches (10–20), medium long, straight to raised; spikelets 20–30; glumes white to reddish white, midlong (21–25 mm), medium in texture; florets 2–3; lemma reddish gray, midlong (17–19 mm), medium wide; nerves 7, usually prominent; palea midwide, reddish gray; spikelet separation by fracture, basal scar

absent to obscure, occasional short to medium long basal hairs present; floret separation by heterofracture; awns numerous, straight, subgeniculate to twisted and geniculate; kernel medium slender; rachilla segment short, medium to medium wide, nonpubescent; no hairs on lemma.

Nora C.I. 8163

Reg. No. 222

Description.—Juvenile growth medium decumbent; culms mid-stout; hairs occasional on sheath; leaf midwide to wide, occasional or nonpubescent margins; plant color dark green.

Adult plant.—Medium early; short (90–95 cm); culms 3–5, stout, pubescence numerous above and below nodes; leaf midwide, ligule present, hairs few to absent on sheath or leaf margin; leaf dark “bluish” green, slightly glaucous; panicle equilateral, medium long (20–22 cm), and medium wide (7–8 cm); rachis medium stout, slightly recurved; nodes 6–7, false node absent; branches 17–22, medium long (5–7 cm), medium slender, straight, slightly raised to drooping; spikelets 20–28; glumes light red, midlong (24–25 mm), medium coarse in texture; florets usually 2, occasionally 3; lemma light red often with slight grayish tinge at base; medium long (16–18 mm), medium wide; nerves 7–9, obscure; palea midwide, reddish with tinge of gray; spikelet separation by fracture; basal scar absent to very obscure, pubescence occasional long; floret separation by fracture, distal to heterofracture; awns occasional, straight to slightly subgeniculate; kernels plump; rachilla segment medium short (1.5–1.75 mm), medium wide, occasional short hair present; no hairs on back of lemma.

Nortex C.I. 2382

Reg. No. 67

Description.—Juvenile growth decumbent; culm medium stout, pubescence on sheath absent; leaf narrow, few hairs on margin of lower leaves; color of leaf medium dark green.

Adult plant.—Medium late; medium tall (110–140 cm); culms 2–3, medium stout, often pink; few hairs below nodes; leaf narrow, ligule present, color medium light green, occasional hairs on sheath and leaf margin; panicle equilateral, medium long (15–25 cm), and medium to wide; rachis medium stout, straight to flexuous, often recurved; nodes 6–7, false node absent; branches (16–22) medium in length (10–14 cm), slender, straight, raised to drooping; spikelets 15–25; glumes red, long (25–30 mm), coarse in

texture; florets 2-3; lemma red, long (19-20 mm); nerves 7, prominent; palea midwide, red flecked with gray; spikelet separation by semiabscission to fracture, basal scar prominent to obscure, basal pubescence numerous, long; floret separation by fracture, usually basal; awns numerous, long, usually straight; kernels slender; rachilla segment long (2-2.5 mm), medium slender, nonpubescent; no hairs on lemma.

Ora C.I. 7976

Reg. No. 195

Description.—Juvenile growth decumbent; culm very stout, few to numerous hairs on sheath; leaf narrow, hairs on leaf absent; plant slightly glaucous.

Adult plant.—Midearly; short to midtall (91-99 cm); culms 3-5, very stout, pubescence few to numerous above and below nodes; leaf narrow, ligule present, hairs few on sheath or leaf margins, leaf dark green, slightly glaucous; panicle equilateral, medium long (16-20 cm), and medium wide (8-9 cm); rachis medium stout, slightly recurved; 6-7 nodes, false node absent; branches (14-19) medium long (5-10 cm), medium slender, slightly drooping; spikelets 16-21; glumes reddish yellow, midlong (21-22 mm), medium coarse in texture; florets 2-3; lemma reddish yellow with some gray flecking, medium long (17-18 mm), medium wide; nerves 7; palea wide, reddish yellow; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional, long; floret separation usually by fracture, distal or heterofracture; awns occasional, straight to subgeniculate; kernels very plump; rachilla segment midlong (1.75-2 mm), medium to wide, nonpubescent; no hairs on lemma.

Palestine C.I. 2328

Reg. No. 139

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaves; leaf width midwide.

Adult plant.—Early; short to tall (71-124 cm); 2-5 culms, occasional hairs below nodes; leaf medium narrow, erect, color medium light green, ligule present, hairs on leaves absent; panicle equilateral, medium short (9-15 cm), and medium wide (8-10 cm); rachis straight and flexuous; 3-5 nodes, false node absent; branches (7-13) short, drooping; spikelets 8-15; glumes reddish, long (28-32 mm), coarse in texture; florets 2-3; lemma reddish, long (20-21 mm); nerves 5-7; palea midwide, red, gray flecked; spikelet separation by abscission to semiabscission, basal scar prominent, numer-

ous long basal pubescence; floret separation by fracture, basal; awns numerous, straight; kernel midplump; rachilla segment short to medium long and slender to midwide, nonpubescent; occasional long hairs on back of lemma.

Pennlan C.I. 7881

Reg. No. 223

Description.—Juvenile growth very decumbent; culms, medium slender; sheath and leaf margins very pubescent; leaves narrow, medium dark green.

Adult plant.—Late; midtall (128–130 cm); culms 2–4, medium slender, numerous hairs above and below nodes; leaf narrow, ligule present, pubescence few to numerous on margins; panicle equilateral, medium long (20–22 cm), and wide (10–12 cm); rachis slender, recurved at tip, very slightly flexuous; 6–7 nodes; false node absent; branches (17–18) slender, drooping, medium long (8–9 cm); spikelets 20–27; glumes light yellow, medium long (20–21 mm), fine in texture; florets 2–3; lemma yellow to light yellow, short (15–16 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, pubescence few or none; floret separation by heterofracture; awns few, straight to subgeniculate; kernel medium plump; rachilla segment long (2–2.5 mm), medium wide, occasional to few long hairs present; few to no hairs on lemma.

Radar I C.I. 7339

Reg. No. 177

Description.—Juvenile growth intermediate to upright; culm medium slender, pubescence occasional to absent on sheath and leaves; leaf medium to narrow, color medium dark green, slightly reddish.

Adult plant.—Early; short to midtall (91–102 cm); culms 2–5, medium slender, few hairs above, numerous below nodes; leaf medium wide, ligule present, few hairs on sheath and leaf margins; panicle equilateral, short (15–18 cm), and medium wide (6–11 cm); rachis straight to flexuous; 4–6 nodes, false node absent; branches (11–17) medium short, straight to raised; spikelets 14–25; glumes red, midlong (20–23 mm), coarse in texture; florets 2–3; lemma reddish yellow, midlong (15–19 mm); nerves 7; palea midwide, grayish red; spikelet separation by fracture, basal scar absent to obscure, pubescence usually absent; floret separation by heterofracture; awns absent; kernel midplump; rachilla segment short, medium slender, nonpubescent; no hairs on lemma.

Radar II C.I. 7340**Reg. No. 178**

Description.—Juvenile growth decumbent; culm stout; no hairs on sheath or leaves; leaf medium wide to narrow, plant color medium dark green, tinted slightly reddish.

Adult plant.—Midearly; medium short (91–96 cm); culms 2–5, very stout, few hairs above or below nodes; leaf medium wide, ligule present, few hairs on sheath or leaf margins; panicle equilateral, short (15–18 cm), and medium wide (10–12 cm); rachis stout, straight to flexuous; 4–6 nodes, false node absent; branches (14–22) medium long (5–8 cm), usually straight to raised; spikelets 18–29; glumes reddish yellow, midlong (21–23 mm), coarse in texture; florets 2–3; lemma light red, short to medium long (14–18 mm); nerves 7; palea midwide, grayish red; spikelet separation by fracture, basal scar absent to obscure, pubescence absent; floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel midplump; rachilla segment short, medium slender, with occasional short hair present; no hairs on lemma.

Ranger C.I. 3417**Reg. No. 94**

Description.—Juvenile growth very decumbent; culm medium stout, slightly reddish, pubescence absent on sheath and margins; leaf narrow, plant color medium light green.

Adult plant.—Midlate; midtall to tall (97–132 cm); culms 2–5, medium stout, occasional hair above and below node; leaf midwide, ligule present, light green color, occasional hair on leaf margins; panicle equilateral, short to midlong (10–18 cm), narrow to medium wide; 4–7 nodes, false node absent; branches (9–22) short to medium long, usually straight and drooping, sometimes raised; spikelets 10–24; glumes red, midlong (22–26 mm), coarse in texture; florets 2, occasionally 3; lemma red, midlong (14–19 mm); nerves 7; palea wide, red; spikelet separation by fracture, basal scar prominent, basal hairs numerous, long; floret separation by basifracture; awns numerous, straight; kernel plump to very plump; rachilla segment short to medium and slender to wide, nonpubescent; hairs on lemma absent.

Rapida C.I. 8303**Reg. No. 212**

Description.—Juvenile growth medium upright; culm medium to slender; nonpubescent sheath, leaf midwide, medium dark green.

Adult plant.—Medium to early, short (78–82 cm); culms 3–4, medium slender; nodal pubescence occasional only; leaf medium narrow; ligule present, medium dark green; nonpubescent sheath and leaf; panicle midshort (12–15 cm), midwide to narrow; rachis straight, slender; sometimes slightly flexuous; nodes 5–6, false node absent; branches 10–12, usually short, and raised; spikelets 10–12; glumes reddish or reddish yellow, midlong (24–25 mm), coarse in texture; florets 2; lemma reddish yellow, midlong (17–18 mm); nerves 7–9, obscure; palea midwide, red to reddish yellow; spikelet separation usually by fracture, basal scar obscure, basal pubescence few to numerous, long; floret separation usually by heterofracture, often basal; awns numerous, straight to twisted geniculate; kernel slender; rachilla medium long, midwide, nonpubescent; no hairs on back of lemma.

Red Rustproof C.I. 1079

Reg. No. 4

Description.—Juvenile growth decumbent; culm stout, reddish in color; few hairs on sheath and leaf margin; leaf narrow, medium dark green.

Adult plant.—Midseason; midtall (99–119 cm); culms 1–4, stout, occasional hairs above and below node; leaf medium narrow, ligule present, hairs on sheath frequently numerous, absent on leaf margin; panicle equilateral, medium long (11–14 cm), medium to wide; rachis straight to recurved; 4–7 nodes, false node absent; branches (10–22) short to long, straight to drooping; spikelets 14–27; glumes red, long (26–28 mm), coarse in texture; florets 2–3; lemma red, long (18–20 mm); nerves 7; palea midwide, red; spikelet separation by abscission to semiabscission, basal scar prominent, pubescence few to numerous, midlong to long, floret separation by basifracture; frequently basal pubescence present on base of secondary floret; awns numerous, straight, subgeniculate to twisted, geniculate; kernel slender to midplump; rachilla segment medium short and medium wide; no hairs on lemma.

Roanoke C.I. 7413

Reg. No. 206

Description.—Juvenile growth very decumbent; culms stout, hairs on culm and sheath absent; leaf medium narrow, hairs on leaf margins few, long; plant color medium dark green.

Adult plant.—Medium late; midtall (110–115 cm); culms 2–5, stout, no hairs on nodes; leaf medium narrow, ligule present, no or occasional hair on sheath and leaf margin; panicle equilateral,

long (17–22 cm), and wide; rachis straight to flexuous; 5–6 nodes, false node absent; branches (16–22) medium long (8–10 cm), straight to drooping; spikelets 20–30; glumes white, medium long (21–23 mm), fine to medium coarse in texture; florets 2–3; lemma white to very light gray, midlong (15–18 mm); nerves 5–7 obscure; palea midwide, grayish white; spikelet separation by fracture, basal scar absent, occasional short hair present, floret separation by heterofracture; awns occasional, straight, subgeniculate to twisted, geniculate; kernel very plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Rustler C.I. 3754**Reg. No. 95**

Description.—Juvenile growth decumbent to medium; culm slender, few hairs on culm; leaf narrow, few hairs on lower leaf margin; plant color light green.

Adult plant.—Midseason; short to midtall (84–114 cm); culms 2–6; hairs on nodes; leaf narrow, ligule present, occasional hair on leaves; panicle equilateral, midlong (11–18 cm), narrow to medium wide; nodes 4–6, false node absent; branches 9–17, short to medium, drooping, straight to raised; spikelets 19–21; glumes red, long (23–32 mm), coarse in texture; florets 2; lemma red, midlong to long (17–18 mm); nerves 7; palea midwide, red; spikelet separation by fracture, basal scar prominent, basal pubescence numerous, long; floret separation by heterofracture; awns numerous, straight; kernel midplump; rachilla segment short and slender to wide, nonpubescent, no hairs on lemma.

Seminole C.I. 5924**Reg. No. 135**

Description.—Juvenile growth upright; culms medium stout, slightly red, pubescence on sheath and leaf margin absent; leaf midwide; plant color medium dark green.

Adult plant.—Midearly; short to midtall (81–109 cm); culms 2–5, medium stout, pubescence below nodes; leaf narrow to midwide, ligule present, color medium dark green, pubescence absent to few; panicle equilateral, medium short (10–15 cm), and medium to wide; rachis straight to flexuous; 4–6 nodes, false node absent; branches (11–20) medium to long, slender, straight to drooping; spikelets 14–25; glumes red, usually midlong (21–25 mm), coarse in texture; florets 2–3; lemma red, gray flecked, midlong (17–19 mm); nerves 7; palea midwide, gray flecked red; spikelet separation usually by

semiabscission, basal scar prominent on lower floret; hairs numerous, long, floret separation usually by basifracture; awns numerous, straight; kernel midplump; rachilla segment medium in length, slender, nonpubescent; few hairs on back of lemma.

Sierra C.I. 7706

Reg. No. 213

Description.—Juvenile growth intermediate to upright; culm stout, few to no hairs on sheath or leaves; plant color yellowish green.

Adult plant.—Early; short (80–86 cm); culms 2–4, usually medium stout, numerous long pubescence above and below nodes; leaf medium wide, ligule present, few hairs on sheath or leaf margins, leaf color light green; panicle equilateral, short (10–15 cm), and wide (7–8 cm); rachis straight to somewhat flexuous; 5–7 nodes, false node absent; branches (11–16) medium short (3–5 cm), straight to raised; spikelets 14–23; glumes reddish white, long (28–31 mm), coarse in texture; florets usually 3; lemma grayish red, long (21–22 mm); nerves 7, prominent; palea midwide, red to grayish red; spikelet separation by fracture, basal scar obscure, basal hairs few, short, floret separation by heterofracture; awns few, straight; kernel medium slender; rachilla segment short, slender, pubescence occasional, short; no hairs on lemma.

Southland C.I. 5207

Reg. No. 131

Description.—Juvenile growth intermediate to upright; culms medium stout; hairs on sheath absent; leaf narrow, occasional hair on leaf margin, color medium light green.

Adult plant.—Early to midearly; short to midtall (86–119 cm); culms 1–7, medium stout, pubescence occasional to numerous both above and below nodes; leaf narrow to medium wide, ligule present, nonpubescent, medium light green; panicle equilateral, long (10–15 cm), narrow to medium wide; rachis straight to flexuous; 4–6 nodes, false node absent; branches (10–26) medium long and stout, straight to raised; spikelets 19–32; glumes white, medium long (18–22 mm), medium in texture; florets 2–3; lemma white, yellow to gray flecked, short to midlong (15–17 mm); nerves 5–7; palea midwide, white to gray; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional, short to medium long, floret separation by heterofracture; awns few, straight; kernel midplump; rachilla segment variable, short to medium long, slender to wide, nonpubescent; no hairs on lemma.

Sumter C.I. 7509**Reg. No. 233**

Description.—Juvenile growth decumbent; culm stout; hairs on sheath and leaf margins usually absent; leaf midwide, color medium dark green.

Adult plant.—Midlate; medium short (90–100 cm); culms 4–7, stout, hairs on nodes absent; leaf midwide, medium dark green, ligule present, pubescence on sheath and leaf absent; panicle equilateral, rather short (10–20 cm) medium wide (8–10 cm); rachis straight to flexuous; nodes 4–5, false node absent; branches (13–18), midlong (7–9 cm), usually somewhat raised in attitude; spikelets 19–25; glumes reddish white, medium long (22–24 mm), coarse in texture; florets usually 3; lemma gray flecked, reddish yellow, long (19–20 mm); nerves 5–7, prominent; palea midwide, light red; spikelet separation by fracture, obscure basal scar, pubescence usually absent; floret separation by basifracture to heterofracture; awns occasional, straight; kernel midplump; rachilla segment midlong (2–2.5 mm), medium slender, nonpubescent; no hairs on lemma.

Sumter 3 C.I. 7886**Reg. No. 234**

Description.—Juvenile growth semidecumbent to decumbent; culm medium stout, slightly pink color, pubescence on sheath and leaf margin few to absent; leaf medium narrow, medium dark green.

Adult plant.—Medium late; midtall (122–124 cm); culms 2–3, medium stout, pubescence few to absent on node; leaf medium wide, medium dark green, very slightly pink, pubescence few to absent on sheath; panicle equilateral, medium long (21–22 cm), narrow to midwide; rachis medium stout, slightly flexuous; nodes 7–8, false node absent; branches (21–25) straight to raised, midlong; spikelets numerous 47–53; glumes yellow, midlong (21–22 mm), medium to coarse in texture; florets usually 2; lemma yellow, short (15–16 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar obscure to absent, basal pubescence absent, floret separation by fracture, distal to heterofracture; awns usually absent; kernel midplump; rachilla segment long (2.5–2.75 mm), occasional very short rachilla hairs present; no hairs on lemma.

Support C.I. 3180**Reg. No. 83**

Description.—Juvenile growth semiupright; culm medium stout, hairs very numerous; leaf narrow, numerous hair on margins, plant color green.

Adult plant.—Midseason; tall to very tall (142–163 cm); culms 1–4, medium stout, hairs below nodes occasional to absent; few to numerous above; leaf midwide, ligule present, occasional hair on margins; panicle equilateral, long to very long (15–28 cm) and wide; 5–7 nodes, false node absent; branches (9–26) medium long to long, drooping; spikelets 14–49; glumes white, midlong (21–26 mm), fine in texture; florets 2, occasionally 3; lemma gray, midlong (16–18 mm); nerves 5–7; palea midwide, gray; spikelet separation by fracture, basal scar absent to obscure, occasional short to long basal hairs, floret separation by fracture, distal to heterofracture; awns numerous, twisted, geniculate; kernel midplump; rachilla segment medium to long and slender, occasional short pubescence; no hairs on lemma.

Suregrain C.I. 7155**Reg. No. 153**

Description.—Juvenile growth decumbent, culm stout, numerous hairs on sheath, none on leaves; leaf medium wide; plant color reddish, somewhat glaucous.

Adult plant.—Early; medium short (91–101 cm); culms 1–4, medium stout; pubescence both above and below nodes; leaf medium wide, ligule present, few hairs on sheath, none on leaves, leaves slightly glaucous; panicle equilateral, medium long (10–20 cm) and medium wide; rachis straight to somewhat flexuous; 4–7 nodes, false node absent; branches (10–20), straight, raised to drooping; spikelets 11–24; glumes red, medium long (20–23 mm), coarse in texture; florets 2–3; lemma red, gray flecked, medium long (16–20 mm); nerves 7; palea wide, yellowish red or gray; spikelet separation by fracture, basal scar obscure, pubescence absent to occasional, short, floret separation by heterofracture; awns occasional straight; kernel very plump; rachilla segment variable, short to midlong (1.5–2.5 mm), slender to wide, pubescence present, occasional, very short to numerous, medium long; no hairs on lemma.

Taggart C.I. 4652**Reg. No. 130**

Description.—Juvenile growth intermediate to upright; culm stout, no pubescence on sheath, few hairs on leaf margin; leaf midwide; plant color medium dark green, slightly pink.

Adult plant.—Medium late; midtall to tall (99–132 cm); culms 1–4, medium to stout, slightly pink in color, pubescence few above, numerous below nodes; leaf medium wide and medium dark green, ligule present, few hairs on sheath or leaf margin; panicle equilateral, short to midlong (12–18 cm) narrow to medium wide; rachis straight to slightly flexuous; 4–8 nodes, false node absent; branches (12–22) short, usually raised, few straight; spikelets 16–35; glumes red, midlong (22–25 mm), coarse in texture; florets 2; lemma red, short to midlong (15–18 mm); nerves 7; palea wide, red; spikelet separation by fracture to semiabscission, basal scar obscure to prominent, few to numerous long basal hairs, floret separation by heterofracture; awns numerous, straight; kernel plump; rachilla segment short to medium in length, medium to wide, pubescence occasional, short; no hairs on lemma.

Tech C.I. 947 (V.P.I. No. 1)**Reg. No. 63**

Description.—Juvenile growth usually very decumbent; culm medium stout, slightly pink; leaf narrow, medium dark green, hairs extremely numerous on sheath and especially at base of leaf and on leaf margin; plant color medium dark green.

Adult plant.—Medium to late; tall (130–142 cm); culms 1–4, stout, very pubescent above and below nodes; leaf narrow, ligule present, medium dark green, sheath and leaf margins very pubescent; panicle equilateral, long (17–30 cm), medium wide; rachis usually straight; 5–8 nodes, false node absent; branches (15–37) medium to long, straight to raised; spikelets 25–71; glumes white, midlong (20–21 mm), fine in texture; florets 2; lemma black with white tip, short to midlong (14–17 mm); nerves 7, prominent; palea midwide, black; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional, short, floret separation by fracture, usually distal to heterofracture; awns occasional to numerous, straight, subgeniculate to twisted, geniculate; kernel midplump; rachilla segment medium long and medium wide, often few short hairs present; occasional hair on back of lemma.

Tennex C.I. 3169**Reg. No. 91**

Description.—Juvenile growth semidecumbent to decumbent; culm stout; leaf narrow to midwide, occasional hairs on sheath and leaf margin; color medium light green.

Adult plant.—Midlate; medium to tall (114–147 cm); culms 2–3, medium stout, hairs few to numerous above and below nodes; leaf midwide, ligule present, hairs on sheath and leaf margin absent to occasional only, color medium light green; panicle equilateral, midlong (15–25 cm), medium to wide; rachis medium slender, straight to flexuous, often recurved; nodes 6–7 or more, false node absent; branches usually 20–30; long, straight, slightly raised to drooping; spikelets numerous 20–40; glumes white to red, medium long (21–25 mm), medium to coarse in texture; florets 2–3; lemma red to grayish red, midlong (17–20 mm); nerves 7; palea midwide, red to grayish red; spikelet separation by fracture, basal scar obscure to usually absent, pubescence absent; floret separation by heterofracture to fracture, distal; awns absent to few, straight to subgeniculate; kernel midplump; rachilla segment medium long, slender to medium wide, pubescence absent to few, short to midlong hairs; no hairs on lemma.

Victorgrain 48–93 C.I. 5355**Reg. No. 137**

Description.—Juvenile growth semiupright; culm stout, occasional pubescence on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midearly; short to midtall (89–117 cm); culms 1–6, stout, hairs on sheath and nodes absent; leaf narrow to midwide, ligule present, medium dark green, occasional hairs on margin; panicle equilateral, midlong (12–18 cm) medium to wide; rachis straight to recurved; 4–6 nodes, false node absent; branches (11–20) short to medium long, medium stout, straight, raised to slightly drooping; spikelets 14–23; glumes light red to red, midlong (21–27 mm), coarse in texture; florets 2 to occasionally 3; lemma grayish red to red, midlong to long (17–21 mm); nerves 5–7, prominent; palea wide, grayish red; spikelet separation by fracture, basal scar absent to obscure, occasional long basal hair present, floret separation usually by heterofracture; awns occasional, straight; kernel very plump; rachilla segment short to medium long, medium wide to wide, occasional short hairs present; no hairs on lemma.

Walken C.I. 8205**Reg. No. 238**

Description.—Juvenile growth decumbent; culms stout; leaf midwide; sheath and leaf margin nonpubescent; plant medium dark green.

Adult plant.—Midseason; short to midtall (90–118 cm); culms 2–5, midstout; nonpubescent at nodes; leaf midwide, medium dark green, ligule present; pubescence slight on sheath and leaf margins, panicle equilateral, short to midlong (13–16 cm), narrow (6–9 cm); rachis straight to slightly flexuous; nodes 6–7, false node absent; branches 18–21, short to midlong (4–7 cm), usually raised to erect in attitude; spikelets 26–36; glumes very light reddish yellow; midlong (20–28 mm), texture medium coarse; florets 2; lemma very light reddish yellow; short (15–16 mm); nerves 7, obscure; palea midwide, very light reddish yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation by fracture; distal to heterofracture; awns occasional, straight; kernel midplump; rachilla segment short (1.5–2.0 mm), nonpubescent; no hairs on back of lemma.

Windsor C.I. 9140**Reg. No. 254**

Description.—Juvenile growth middecumbent; culm midstout; pubescence slight on sheath or leaf; leaf midwide, medium light green.

Adult plant.—Early; midshort (85–110 cm); culms 3–4 stout, nodal pubescence few, present both above and below; leaf midwide, ligule present, medium light green, pubescence on sheath and lower leaf margins; panicle equilateral, midlong (18–22 cm) and midwide; rachis straight to slightly flexuous; nodes 6–8, false node absent; branches 18–20, midlong (8–9 cm), usually straight to raised; spikelets 12–20; glumes reddish yellow, midlong (22–25 mm), medium coarse in texture; florets 2–3; lemma grayish red to grayish yellow midlong (16–18); nerves 7; palea midwide, grayish red; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence few, short; floret separation by fracture, usually distal; awns very few, straight; kernel plump; rachilla segment short (1.5–1.75 mm), midwide and nonpubescent; no hairs on back of lemma.

Winter Turf C.I. 1570**Reg. No. 34**

Description.—Juvenile growth very decumbent; culm stout, pubescence numerous on culm, sheath and leaf margins; leaf narrow; plant color medium dark green.

Adult plant.—Very late; tall (137–140 cm); culms 2–3, stout, pubescence usually absent above and below nodes; leaf narrow, ligule present, occasional to few hairs on sheath and margin; panicle equilateral, long (19–23 cm) and wide (13–15 cm); rachis long, flexuous, medium slender, recurved; 4–8 nodes, false node absent; branches numerous (17–27), long, slender, usually drooping; spikelets often very numerous (28–66); glumes white, midlong (20–22 mm), fine in texture; florets usually 2–3; lemma gray, midlong (16–18 mm); nerves 7, prominent; palea midwide, gray; spikelet separation by fracture, basal scar absent to obscure, basal pubescence present, occasional few short, floret separation by heterofracture; awns numerous, usually subgeniculate to geniculate and twisted; kernel medium slender; rachilla segment long and slender with occasional short pubescence; no hairs on lemma.

Wintok C.I. 3424**Reg. No. 121**

Description.—Juvenile growth very decumbent; culm stout, hairs very numerous on sheath; leaf narrow, numerous hairs on leaf margin; plant color medium dark green, slightly red.

Adult plant.—Medium late; medium tall (119–135 cm); culms 1–5, medium stout, hairs few above and numerous below nodes; leaf narrow, ligule present, few hairs present on sheath and leaf margin, medium dark green; panicle equilateral, medium long (16–23 cm) and wide (8–11 cm); rachis straight to recurved, flexuous; 4–7 nodes, false node absent; branches (15–26) medium long, slender, straight to drooping; spikelets 14–39; glumes white, midlong (20–22 mm), fine in texture; florets 2; lemma gray, midlong (15–18 mm); nerves 7, prominent; palea midwide, gray; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional short to long, floret separation by fracture, usually distal; awns few to numerous, straight, subgeniculate to twisted and geniculate; kernels medium plump; rachilla segment medium to long and slender, few short to midlong hairs present; no hairs on lemma.

Yancey C.I. 8420**Reg. No. 228**

Description.—Juvenile growth medium decumbent, culms medium stout; slight pubescence on culm and sheath; leaf medium wide; slight pubescence on margin, medium dark green.

Adult plant.—Medium late; midtall (98–110 cm); culms 3–5, midstout; few hairs below node; leaf midwide, ligule present, few to numerous hairs on sheath and leaf margin; panicle equilateral, short to midlong (10–20 cm), and midwide; rachis midstout, straight to slightly flexuous; nodes 6–7; false node absent; branches 20–22, midlong, straight to raised; spikelets 25–27; glumes yellowish white, midlong (20–22 mm), medium coarse in texture; florets 2; lemma light reddish yellow, medium short (15–16 mm); nerves 7, obscure; palea wide, yellowish red; spikelet separation by fracture, basal scar obscure, basal pubescence long, few to numerous; floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel plump; rachilla segment midlong (2–2.25 mm), midstout; nonpubescent; no hairs on back of lemma.

Not Registered by the American Society of Agronomy**Alber C.I. 2766**

Description.—Juvenile growth semidecumbent, culm stout, pubescence on sheath, leaf narrow, few hairs on margin, color medium dark green.

Adult plant.—Medium late; midtall (125–130 cm); culms 2–4, midstout, occasional pubescence above, absent below nodes; leaf midwide, ligule present, few hairs on sheath and leaf margins; panicle equilateral, midlong (16–20 cm), medium wide; rachis straight, recurved at tip; nodes 6–7, false node absent; branches (12–24) long, slender, somewhat drooping; spikelets 23–38; glumes reddish white, long (25–29 mm), medium to coarse in texture; florets 2–3; lemma red to grayish red, midlong (20–21 mm); nerves 7; palea midwide, grayish red; spikelet separation by semiabscission; basal scar prominent, numerous long basal hairs; floret separation usually by basifracture; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment medium long and medium wide, few to occasional short hairs present; no hairs on lemma.

Almeria C.I. 606

Description.—Juvenile growth medium upright; culm slender; hairs on sheath and leaf margin absent; leaves narrow, light green.

Adult plant.—Late; midtall (94–122 cm); culms 1–5, medium slender, rather weak, hairs at nodes absent; leaf narrow, ligule present, light green, no hairs on sheath or margin; panicle equilateral, midlong (18–22 cm), wide (9–15 cm); rachis medium slender, straight, recurved; nodes 4–6, false node absent; branches (13–27) medium long, drooping; spikelets 15–39; glumes white, medium long (22–25 mm), fine in texture; florets 2; lemma black with white tip, short to midlong (14–18 mm); nerves 5–7, palea midwide, black; spikelet separation usually by fracture, basal scar absent to very obscure, basal pubescence few, medium long; floret separation by fracture, distal; awns occasional, straight, subgeniculate to twisted; kernel midplump; rachilla segment medium long, slender, pubescence numerous, short; no hairs on lemma.

Anderson C.I. 4651

Description.—Juvenile growth medium to upright; culms stout, slightly red, sheath very pubescent; leaf medium narrow, margins of lower part of leaf pubescent, color medium light green.

Adult plant.—Midearly to midlate; midtall (105–120 cm); culms 1–5, stout, hairs on nodes variable, absent to numerous above and below; leaf midwide, ligule present, hairs on margins absent to few; panicle equilateral, short (10–15 cm), narrow to medium wide; rachis straight to flexuous and recurved; 5–6 nodes, false node absent; branches (14–19) short to medium long, medium stout, straight, raised to drooping; spikelets 12–29; glumes reddish, medium long (21–25 mm), fine to medium coarse in texture; florets 2–3; lemma short to midlong (15–18 mm), medium light red to grayish red; nerves prominent 5–7; palea wide, grayish red; spikelet separation variable, mostly by fracture, basal scar absent to obscure, pubescence absent to few, variable from long to short, floret separation usually by heterofracture; awns absent to occasional straight; kernels very plump; rachilla segment very short, medium to very wide, pubescence absent to few, very short; no hairs on lemma.

Appler C.I. 1815

Description.—Juvenile growth semidecumbent; culm stout, reddish, pubescence on sheath; leaf narrow, few hairs on margins, color medium dark green.

Adult plant.—Medium late; medium tall (118–140 cm); culms 2–4, medium stout, somewhat red in color, occasional pubescence above and below nodes; leaf medium wide, ligule present, few to numerous hairs on sheath and leaf margins; panicle equilateral, midlong (10–15 cm), medium wide; rachis straight, slender, recurved at tip; 5–7 nodes, false node absent; branches (10–22), long, slender, drooping; spikelets 16–25; glumes red, long (26–28 mm), medium coarse in texture; florets 2–3; lemma red, midlong (18–20 mm); nerves 7; palea midwide, red; spikelet separation by semiabscission, basal scar prominent, numerous long basal hair present, floret separation usually by basifracture or heterofracture; awns numerous, straight; kernel midplump; rachilla segment medium short, wide, occasional long hair present; occasional hair on back of lemma.

Ascencao C.I. 7146

Description.—Juvenile growth semidecumbent to decumbent; culm intermediate to stout, slight pubescence on sheath; leaf intermediate in width, slight pubescence present, medium dark green in color.

Adult plant.—Midlate; intermediate in height (90–100 cm); culms 2–4, medium stout, slightly reddish, slight or no pubescence on culm; leaf medium in width, drooping, ligule present, medium dark green, slight pubescence on sheath and margins; panicle equilateral, midlong (12–16 cm) and wide (12–15 cm); rachis straight to slightly flexuous; 5–6 nodes, false node absent; branches (16–20) medium long (10–12 cm), straight to drooping; spikelets 15–20; glumes reddish, long (20–27 mm), medium coarse in texture; florets 2–3; lemma grayish red, midlong (17–19 mm); nerves 7, very prominent; palea midwide, dark reddish to gray; spikelet separation by fracture, basal scar absent to obscure, slight or no basal pubescence, floret separation by basifracture or heterofracture; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment medium in length and width, nonpubescent; no hairs on lemma.

Aurora C.I. 831

Description.—Juvenile growth intermediate to upright; culms stout, slight or no pubescence on sheath or leaf; leaf intermediate in width, light green in color.

Adult plant.—Intermediate in maturity; midtall (115–120 cm); culms 2–3, midstout, some pubescence above and below nodes; leaf medium wide, ligule present, yellowish green color, moderately

pubescent on sheath and margin of lower third of leaf; panicle equilateral, midlong (14–20 cm), medium to narrow; rachis straight to flexuous; 5–7 nodes, false node absent; branches (15–20), short to medium long; spikelets 18–24; glumes reddish yellow, midlong (18–25 mm) fine in texture; florets 2–3; lemma short (13–15 mm), yellow; nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar slight to obscure, pubescence absent to occasional; floret separation by fracture, usually distal; awns usually absent, but very occasional short, straight awns present; kernel very plump; rachilla segment very short and wide, nonpubescent; no hairs on lemma.

Awnless Culred C.I. 2676

Description.—Juvenile growth semiupright; culm intermediate to slender, occasional hairs on sheath; leaf narrow, occasional hairs on margin, color light green.

Adult plant.—Medium late; midtall (118–143 cm); culms 2–4, medium slender, few to numerous hairs above and below nodes; leaf narrow, light green, ligule present, occasional hair on margin; panicle equilateral and widespread, medium long (21–24 cm); rachis straight to recurved; 4–6 nodes, false node absent; branches (14–16) long, slender and drooping; spikelets (16–30); glumes yellowish red, long (22–27 mm), medium to coarse in texture; florets 2–3; lemma gray, midlong (15–18 mm); nerves 7, prominent; palea midwide, gray; spikelet separation by semiabscission to fracture, basal scar usually obscure, usually numerous, long pubescence present, floret separation by fracture or heterofracture; awns absent; kernel plump; rachilla segment medium long and medium slender, occasional to few hairs present; no hairs on lemma.

Ballard C.I. 6980

Description.—Juvenile growth very decumbent; culm very stout, numerous hairs on sheath; leaf narrow to midwide, dark green with numerous hairs on margin.

Adult plant.—Midlate; very tall (150–165 cm); culms 2–4, medium to stout, often slightly reddish in color, numerous hairs above and below nodes; leaf medium wide, ligule present, numerous hairs on margins; panicle equilateral, long (22–28 cm), and wide (12–15 cm); rachis slender, long, recurved at tip; 6–7 nodes, false node absent; branches (17–28) long (8–9 cm), slender, straight, raised to drooping; spikelets 21–44; glumes light red, medium long (20–23 mm), medium coarse in texture; florets 2–3; lemma reddish to grayish red in color, long (17–18 mm); nerves 7; palea midwide, grayish red;

spikelet separation usually by fracture, slight or no basal scar, pubescence absent, floret separation by basifracture or heterofracture; awns numerous, straight to subgeniculate; kernal midplump; rachilla segment midlong (2–2.5 mm) and midwide, nonpubescent; no hairs on lemma.

Bicknell C.I. 3218

Description.—Juvenile growth decumbent; culm very stout, sheath very pubescent; leaf medium wide to narrow, very pubescent, plant color medium dark green.

Adult plant.—Medium late; midtall (117–145 cm); culms 1–3, very stout, pubescence numerous above and below nodes; leaf narrow, ligule present, leaf medium dark green, margins pubescent; panicle equilateral, medium long (10–25 cm), very wide (12–18 cm); rachis straight to flexuous; 6–7 nodes, false node absent; branches (18–28), very long and slender, straight to drooping; spikelets 23–49; glumes yellowish white, long (21–23 mm), medium fine in texture; florets 1–2; lemma yellow, midlong (14–17 mm); nerves 7; palea midwide, grayish yellow; spikelet separation by fracture, without scar or pubescence; floret separation by basifracture; awns very few, straight to subgeniculate; kernel midplump; rachilla segment intermediate in length and width, nonpubescent; no hairs on lemma.

Black Algerian C.I. 3215

Description.—Juvenile growth decumbent; culms stout; leaf intermediate in width and color with slight pubescence on sheath and leaf margins.

Adult plant.—Late; medium tall (125–135 cm); culms 2–3 stout, pubescent below nodes; leaf medium wide, ligule present, slight or no pubescence on sheath or leaf, plant color intermediate green; panicle equilateral, medium long (12–15 cm) and medium wide (10–12 cm); rachis straight; 5–7 nodes, false node absent; branches (14–19), medium long, drooping; spikelets (15–21); glumes red to grayish red, long (25–30 mm), coarse in texture; florets 2–3; lemma black with grayish tip, long (19–21 mm); nerves 7; palea midwide, black to dark gray; spikelet separation by fracture, basal scar obscure to prominent, hairs absent to numerous, floret separation usually by basifracture; awns numerous, straight; kernel medium slender; rachilla segment medium in length, slender, nonpubescent; no hairs on lemma.

Bond C.I. 2733

Description.—Juvenile growth medium to upright; culms medium stout, slightly pink, sheath nonpubescent; leaf midwide, nonpubescent, medium to dark green.

Adult plant.—Medium early; short (74–99 cm); culms 2–3, medium stout, pubescence few to numerous below and few above node; leaf medium wide, ligule present, dark green color, no hairs on sheath or leaf margins; panicle equilateral, usually short (10–15 cm), narrow to medium wide; rachis medium stout, straight to flexuous; 4–6 nodes, false node absent; branches (10–26), short to midlong, few straight, mostly raised in attitude; spikelets 20–30; glumes red, midlong (20–24 mm), coarse in texture; florets 2–3, usually 3; lemma red to grayish red, short (15–17 mm); nerves 7; palea wide, grayish red; spikelet separation by fracture to semi-abscission, basal scar prominent to obscure, pubescence numerous, long; floret separation by heterofracture to basifracture; awns numerous, straight; kernel usually very plump; rachilla segment very short, very wide, nonpubescent; no hairs on lemma.

Boswell C.I. 480

Description.—Juvenile growth decumbent; culms medium slender, pubescence on culm and sheath very numerous; leaf very narrow, hairs on margin very numerous, plant color medium dark green.

Adult plant.—Late; medium tall (100–132 cm); culms 4–6 medium slender, hair on nodes absent; leaf very narrow, ligule present, hairs on sheath and leaf margin very numerous; panicle equilateral, long (23–28 cm), intermediate in width; rachis slender; 5–7 nodes, false node absent; branches (21–25), long, slender and weak, straight to drooping; spikelets 30–48; glumes reddish, long (24–26 mm), medium to coarse in texture; florets, usually 2, second floret usually extremely short; lemma black with lighter tip, long (18–20 mm); nerves 7, very obscure; palea midwide, black; spikelet separation by fracture, basal scar absent to very obscure, pubescence sparse, medium long, floret separation by fracture, usually distal; awns numerous, twisted and geniculate; kernel midplump; rachilla segment medium to long, slender, occasional hairs present; no hairs on lemma.

Calcutta C.I. 794

Description.—Juvenile growth usually upright; culm midstout, sheath slightly pubescent; leaf medium narrow, nonpubescent, and medium light green.

Adult plant.—Medium late; short to midtall (63–129 cm); culms 2–3, medium stout, pubescence few to numerous above and below node; leaf medium narrow, ligule present, few to no hairs on sheath or leaf margin; panicle equilateral, short to medium long (10–25 cm), and usually wide; rachis usually straight to recurved at tip, slightly flexuous; 4–6 nodes, false node absent; branches (10–30) medium to long, straight to very drooping; spikelets 20–40; glumes red, long to very long (25–40 mm), coarse in texture; florets 2–3; lemma red or grayish red, very long (18–21 mm); nerves 7; palea midwide, usually gray or grayish red; spikelet separation by semiabscission, basal scar prominent to obscure, pubescence few to numerous, short to long, floret separation usually by basifracture; awns absent to numerous, straight; kernel slender to midplump; rachilla segment short to long, slender to usually wide, pubescence usually absent but occasional short to long hairs present; no hairs on lemma.

California Red C.I. 1026

Description.—Juvenile growth decumbent; culms medium to stout, reddish, hairs on culms and sheath very numerous, leaf narrow, hairs on lower leaf margin numerous.

Adult plant.—Midseason; midtall (86–117 cm); culms 2–5, medium stout, hairs on nodes few above and below; leaves midwide, ligule present, few or no hairs on leaf, medium dark green color; panicle equilateral, midlong (14–20 cm), widespread; rachis slender, usually straight to recurved, 4–7 nodes, false node absent; branches (10–19), slender, medium long, drooping; spikelets 19–26; glumes red, very long (22–28 mm), coarse in texture; florets 2–3; lemmas red, midlong (17–21 mm); nerves 7; palea midwide, red or gray-flecked red; spikelet separation by abscission to semiabscission, basal scar prominent, numerous long basal hairs present, floret separation by basifracture to heterofracture; awns numerous, straight; kernel midplump; rachilla segment medium long and medium wide, occasional long hair present; no hairs on back of lemma.

Camellia C.I. 4079

Description.—Juvenile growth semiupright, culm midstout, sheath and leaves slightly pubescent, leaves midwide, medium dark green.

Adult plant.—Midearly; short to midtall (80–105 cm); culms 2–5, stout; pubescence slight above, few below node; leaf midwide, ligule present, medium dark green, slight or no pubescence on sheath or leaf margins; panicle equilateral, midlong (16–20 cm),

medium wide; rachis medium stout, straight to very slightly flexuous; nodes 4-7, false node absent; branches (12-30) midlong, straight to slightly raised in attitude; spikelets 20-35; glumes red, midlong (20-22 mm), rather coarse in texture; florets 2-3; often 3; lemma medium light red, sometimes grayish tinged, short (14-16 mm); nerves 7; palea wide to distinctly wide, reddish gray; spikelet separation by semiabscission, basal scar medium to obscure, pubescence present, midlong; floret separation by heterofracture to basifracture; awns often numerous, straight to subgeniculate; kernel usually very plump; rachilla segment short, wide, usually nonpubescent; no hairs on lemma.

Capa C.I. 2765 (Pampa)

Description.—Juvenile growth decumbent; culms medium stout, reddish; pubescence on sheath numerous; leaf narrow, very pubescent on margin, plant medium dark green.

Adult plant.—Late; midtall (94-112 cm); culms 2-4, medium stout, few hairs below nodes; leaf medium to wide, ligule present, medium dark green color, hairs on leaf occasional; panicle equilateral, medium long (15-20 cm), medium to wide; rachis straight to flexuous; 5-6 nodes, false node absent; branches (10-23), medium to long, straight to drooping; spikelets 22-25; glumes red, long (21-24 mm), fine to coarse in texture; florets 2-3; lemma gray, short (15-16 mm); nerves 7; palea midwide, gray; spikelet separation usually by fracture, basal scar absent to obscure, pubescence occasional to few short, floret separation usually by heterofracture; awns few to numerous, straight, subgeniculate to twisted geniculate; kernel midplump; rachilla segment medium long, slender to midwide, pubescence absent to occasional; no hairs on lemma.

Carolina Red C.I. 4313

Description.—Juvenile growth decumbent to upright; culms medium to stout; leaf medium in width; slight to no pubescence on sheath and leaf; plant color medium light green.

Adult plant.—Medium late; midtall (90-120 cm); culms 2-4, medium stout, often somewhat red in color, very few hairs above and below node; leaf midwide, ligule present, few or no hairs on leaf or sheath; panicle equilateral, medium long (15-20 cm), wide; rachis straight to recurved; 5-6 nodes, false node absent; branches (18-19), medium long; spikelets 21-25; glumes reddish, midlong (21-24 mm), fine to coarse in texture; florets 2-3; lemma light red, medium long (16-18 mm); nerves 7; palea midwide, red or yellowish red;

spikelet separation usually by semiabscission, basal scar absent to obscure, pubescence sparse to medium, long or short, floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium long, slender to medium wide, pubescence absent; no hairs on back of lemma.

Ceirch du Bach C.I. 2923

Description.—Juvenile growth very decumbent; culm midstout, pubescence slight to absent on leaf and sheath; leaf midwide, medium dark green.

Adult plant.—Midtall to tall (130–140 cm); culms 3–4, midslender, pubescence absent above and few below nodes; leaf midwide, ligule present, medium dark green; pubescence slight to absent on leaf and sheath; panicle equilateral, long (25–27 cm), and wide (16–20 cm); rachis slender, recurved at tip; nodes 7–8, false node absent; branches (17–25), midlong to long (8–10 cm); slender; straight to drooping; spikelets 53–74; glumes yellowish white, midlong (21–22 mm), medium coarse in texture; florets 2; lemma black, short to midlong (15–16 mm); nerves 7, obscure; palea narrow, black; spikelet separation by fracture; basal scar absent to obscure; basal pubescence few to numerous; short to midlong; floret separation by fracture, distal to slightly heterofracture; awns numerous on primary florets; subgeniculate to straight; kernel midslender; rachilla segment midlong (2.50–2.75 mm), midwide, and nonpubescent; no hairs on back of lemma.

Century C.I. 8351

Description.—Juvenile growth semidecumbent; culm midstout, slight or no pubescence on sheath or leaf margin; leaf midwide and medium dark green.

Adult plant.—Midlate; midtall (105–110 cm); culms 3–4, midstout, pubescence usually absent at node and on sheath and leaf margin; leaf midwide, medium dark green; ligule present, panicle midlong (18–21 cm), midwide to wide; rachis midstout, somewhat flexuous; nodes 8–9; false node absent; branches 18–25, midlong (6–7.5 cm); spikelets 29–60; glumes reddish white, midlong (20–22 mm), medium coarse in texture; florets usually 2; lemma yellow, short (15–16.5 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure; basal pubescence usually absent; floret separation by fracture, usually distal; awns absent; kernel midplump; rachilla segment midlong (2.25–2.50 mm), nonpubescent; no hairs on lemma.

Cleo C.I. 6740

Description.—Juvenile growth medium decumbent to upright; culm stout; sheath and leaves nonpubescent; leaf medium wide, dark green.

Adult plant.—Medium late; medium tall (99–114 cm); culms 1–4, stout, hairs on node absent; leaf medium wide, ligule present, no pubescence on sheath or leaf; panicle equilateral, medium long (17–20 cm), and wide; rachis straight to flexuous; 4–6 nodes, false node absent; branches (14–20), medium long, usually straight; spikelets 18–30; glumes very light yellow to white, medium long (18–23 mm), medium coarse in texture; florets 2–3; lemma white to yellowish white, medium long (16–18 mm); nerves 5–7; palea wide, white with some gray flecks; spikelet separation by fracture, basal scar absent, nonpubescent, floret separation by fracture, distal to heterofracture; awns absent to few, straight; kernel very plump; rachilla segment short (1.75–2 mm) and medium wide, nonpubescent; no hairs on lemma.

Colwin C.I. 5118

Description.—Juvenile growth very decumbent; culm very stout, numerous hairs on culm and sheath; leaf narrow, very numerous hairs on leaf margins, color medium dark green.

Adult plant.—Late; tall (127–147 cm); culms 1–4, medium slender, pubescence few to numerous above and below node; leaf narrow; ligule present, pubescence numerous on sheath and leaf margins; panicle equilateral, midlong (17–25 cm), and medium wide; rachis straight to flexuous; 5–7 nodes, false node absent; branches (16–19) medium to long, raised, straight to drooping; spikelets 18–30; glumes white, midlong (20–24 mm), fine to medium in texture; florets 2; lemma yellow, sometimes gray flecked, short to medium long (13–18 mm); nerves 5–7 prominent; palea midwide, usually yellow, gray flecked; spikelet separation by fracture, basal scar absent, pubescence absent to few, floret separation by fracture, usually distal; awns few to numerous, usually straight, but occasional subgeniculate to geniculate, twisted; kernel midplump; rachilla segment medium long, slender to medium wide, pubescence absent to occasional, very short; no hairs on lemma.

Coy C.I. 4600

Description.—Juvenile growth decumbent; culms stout; leaf midwide; pubescence numerous, long on sheath and leaf margins; plant medium light green.

Adult plant.—Midlate; midtall (107–115 cm); culms 2–3, stout, nonpubescent at nodes; leaf midwide, medium light green, ligule present; pubescence few to numerous on sheath and leaf margins; panicle equilateral, long (14–17 cm), midwide (8–15 cm); rachis flexuous, recurved at tip; nodes 6–7, false node absent; branches 17–22, midlong (8–10 cm), straight to drooping; spikelets 24–35; glumes light reddish to yellowish white, midlong (21–22 mm), texture coarse; florets 2–3; lemma yellow, midlong (17–18 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture; basal scar absent, basal pubescence absent; floret separation by fracture, distal to heterofracture; awns occasional, straight; kernel slender; rachilla short to midlong (1.5–2.5 mm), medium slender, nonpubescent; no hairs on back of lemma.

Culred C.I. 3217

Description.—Juvenile growth decumbent; culm stout, slightly red, very pubescent; leaf medium wide to narrow, pubescence numerous on sheath and leaf margin; plant color medium dark green.

Adult plant.—Late; midtall (95–122 cm); culms 3–5, stout, pubescence numerous above and below nodes; leaf midwide, medium dark green, ligule present, numerous hairs on leaf margins; panicle equilateral, midlong (18–22 cm), medium wide; rachis flexuous, medium stout, recurved; nodes 4–7, false node absent; branches (18–26), short to long, slender, weak and drooping; spikelets 11–40; glumes reddish white, long (21–25 mm), fine to coarse in texture; florets 2; lemma grayish red, long (17–19 mm); nerves 5–7, very prominent; palea narrow, gray; spikelet separation by abscission or semiabscission, basal scar obscure to often prominent, pubescence numerous, long, floret separation usually by heterofracture; awns few to numerous, straight to subgeniculate; kernel slender to midplump; rachilla segment medium long, very slender, nonpubescent; no hairs on lemma.

Delta Red 88 C.I. 4220

Description.—Juvenile growth medium decumbent; culm stout, reddish in color, pubescence on sheath and leaf margins very numerous; leaf narrow; young leaves medium dark green, often reddish tinted.

Adult plant.—Late; tall (130–142 cm); culms 2–4, medium to stout; hairs on sheath and node few to numerous above and below; leaves medium narrow, medium dark green, ligule present, few hairs on leaf margin; panicle equilateral, usually short (10–15 cm),

and medium narrow; rachis straight to flexuous, medium slender, recurved; nodes 4-7, false node absent; branches (9-18), medium slender, straight to raised to drooping; spikelets 18-37; glumes light red to red, long (25-27 mm), medium to coarse in texture; florets usually 2, lemma red, medium long (17-20 mm); nerves 5-7 prominent, palea midwide, red, gray flecked; spikelet separation by abscission to semiabscission, basal scar usually prominent, pubescence numerous, long, floret separation by basifracture; awns numerous, straight; kernel midplump; rachilla segment short to medium long and medium wide, with occasional long pubescence; no hairs on lemma.

Dwarf Culberson C.I. 748

Description.—Juvenile growth very decumbent; culms stout, sheath very pubescent; leaf narrow, very pubescent margins; plant color medium dark green.

Adult plant.—Late; midtall (99-122 cm); culms 1-4, stout, pubescence numerous both above and below node; leaf narrow, ligule present, medium dark green, sheath and leaf margins very pubescent; panicle equilateral, short to medium long (10-25 cm), medium to wide; rachis usually straight to somewhat flexuous, erect and recurved; nodes 3-6, false node absent; branches 11-25, medium to long, usually drooping; spikelets 15-28; glumes white, midlong (18-22 mm), fine in texture; florets usually 2; lemma yellow, short to medium long (15-18 mm); nerves 5-7, prominent; palea midwide, usually gray; spikelet separation usually by fracture, basal scar absent to obscure, pubescence occasional, short, floret separation usually by fracture, distal; awns occasional, straight; kernel slender to medium wide; rachilla segment long and slender, pubescence occasional, short; no hairs on lemma.

Earlygrain C.I. 7708

Description.—Juvenile growth decumbent; culm medium stout, few hairs on sheath, culm or leaves; leaf medium wide, color medium dark green.

Adult plant.—Medium early; short (84-90 cm); culms 2-3, medium stout, few hairs above node, numerous below; leaf midwide, ligule present, few hairs present on sheath or leaf margins; panicle equilateral, short (13-15 cm), and medium wide; rachis straight to flexuous; nodes 4-5, false node absent; branches (11-13) midlong (4-8 cm), raised to straight; spikelets few, 11-16; glumes light red, long (26-30 mm), coarse in texture; florets 2-3; lemma red to grayish red or gray flecked red; midlong (15-18 mm); nerves 5-7;

palea midwide, gray; spikelet separation by fracture usually, obscure basal scar, basal pubescence absent to occasional, medium long; floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment midlong (2–2.5 mm) and medium slender, pubescence short, few to absent; no hairs on lemma.

Early Wintok C.I. 5849

Description.—Juvenile growth very decumbent to intermediate; culm stout, pubescence very numerous on sheath and leaf; leaf medium to very narrow, medium dark green.

Adult plant.—Early; midtall (110–115 cm); culms 2–3, very slender, pubescence absent above nodes, sparse below; leaf medium wide, ligule present, medium light green, pubescence absent on sheath and leaf; panicle equilateral, medium long (20–27 cm), wide (7–8 cm); rachis slightly flexuous; nodes 5–6, false node absent; branches (14–20), long (8–10 cm) and slender, drooping; spikelets 20–28; glumes white, midlong (20–21 mm), very fine in texture; florets 2; lemma gray or grayish white, short (15–16 mm); nerves 7, prominent; palea midwide, yellow; spikelet separation by fracture, obscure basal scar, basal pubescence sparse, long, floret separation by fracture, distal or heterofracture; awns numerous, twisted geniculate or subgeniculate; kernel medium plump; rachilla segment medium long (2.25–2.5 mm), slender, nonpubescent; no hairs on lemma.

Excel C.I. 7603

Description.—Juvenile growth very decumbent; culm very stout, sheath very pubescent; leaf very narrow, hairs very numerous on leaf margins, leaf color medium dark green.

Adult plant.—Medium early; midtall (117–120 cm); culms 4–6, very stout; hairs on node absent; leaf narrow to medium wide, ligule present, hairs on sheath, leaf margin, and even midveins numerous; panicle equilateral, medium long (15–25 cm), and medium wide; rachis straight; nodes 6–7, false node absent; branches (16–20) long, usually raised; spikelets 23–26; glumes white, midlong (21–25 mm), medium coarse in texture; florets 2; lemma light gray, midlong (15–18 mm); nerves 7; palea midwide, light gray; spikelet separation by fracture, basal scar absent to obscure, pubescence absent, floret separation by fracture, usually distal; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment medium to long, slender to medium wide, pubescence absent to few, short; no hairs on lemma.

Florida 167 C.I. 4320

Description.—Juvenile growth very decumbent; culm medium stout, culm and leaf pinkish in color, few to numerous hairs on sheath and leaf; plant medium dark green.

Adult plant.—Early; midtall (110–125 cm); culms 2–5 medium stout, pubescence few above, numerous below node, leaf medium wide, medium dark green, ligule present, hairs on leaf margins few or none; panicle equilateral, medium short (13–16 cm), medium wide (8–9 cm); rachis straight to recurved; nodes 5–6, false node absent; branches (21–22) long, straight to drooping; spikelets 31–34; glumes medium long (22–23 mm), red, coarse in texture; florets 2; lemma red, medium short (16–17 mm); nerves 7–9; palea midwide, red; spikelet separation by fracture, basal scar absent to obscure, pubescence numerous, long; floret separation by heterofracture; awns absent or straight; kernel midplump; rachilla segment long (2.25–2.5 mm) and medium slender, pubescence very numerous, long; no hairs on lemma.

Florida 501 C.I. 8226

Selected from Florida 500, C.I. 8025, Reg. No. 205. Differs from parent source in being morphologically more uniform, primarily in maturity, color of glumes, and lemma. It also is more uniformly resistant to certain diseases, particularly crown rust race 264.

Florilee C.I. 4060

Description.—Juvenile growth intermediate to upright; culm medium slender, pubescence extremely numerous on culm and sheath; leaf very narrow, very numerous hairs on margins, color light green.

Adult plant.—Midlate; midtall (104–130 cm); culms 1–4, medium slender, hairs on node absent; leaf midwide, light green, ligule present, few hairs on sheath and leaf margins; panicle equilateral, medium in length and medium to wide; rachis straight to flexuous, slender, recurved; nodes 4–6, false node absent; branches (13–22) medium to long, straight to drooping; spikelets 16–27; glumes reddish, midlong (22–29 mm), coarse in texture; florets 2–3; lemma reddish yellow, midlong (16–19 mm); nerves 7; palea midwide, red; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional, long; floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment short to medium long, slender to wide, pubescence absent to few, short to occasional, long; no hairs on lemma.

Forager C.I. 7136

Description.—Juvenile growth intermediate to upright; culm intermediate to medium stout, culm slightly colored pink; leaf medium wide, pubescence on leaf and sheath absent to few, plant color medium dark green.

Adult plant.—Late; very tall (160–165 cm); culms 1–2, medium stout, few hairs above nodes; leaf medium to wide and drooping, medium dark green, ligule present, few or no hairs on sheath or leaves; panicle equilateral, long (17–25 cm), and wide; rachis medium stout; nodes 7–8, false node absent; branches (15–25) long (6–13 cm), straight to very drooping; spikelets 25–40; glumes red, very long (28–37 mm), coarse in texture; florets 2; lemma red, very long (20–22 mm); nerves 7, very obscure; palea narrow, red; spikelet separation by fracture, basal scar absent to obscure, nonpubescent; floret separation by heterofracture; awns numerous on lower florets, twisted and geniculate; kernel long, medium slender; rachilla segment long (2.25–2.5 mm) and very slender, occasional rachilla hair present, medium long; no hairs on lemma.

Fullbright C.I. 5126

Description.—Juvenile growth upright; culm medium stout, occasional hairs on sheath; leaf midwide, medium dark green, very occasional hair on leaf margins.

Adult plant.—Medium late; midtall (94–122 cm); culms 1–4, medium stout, numerous hairs above and few below node; leaf midwide, medium dark green, ligule present, no hairs on leaves; panicle equilateral, midlong (15–23 cm), and wide; rachis usually straight; nodes 5–6, false node absent; branches (14–23), long, straight to raised; spikelets 17–47; glumes light red to pink, midlong (18–23 mm), coarse in texture; florets 2–3; lemma yellow, short to long (15–20 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, nonpubescent, floret separation by fracture, distal or heterofracture; awns absent; kernel plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Fulmer C.I. 3216

Description.—Juvenile growth intermediate to decumbent; culm medium to slender, hairs absent on sheath and leaf; leaf very narrow, color medium green to slightly reddish.

Adult plant.—Medium late; variable in height, short to tall (72–140 cm); culms 3–4, medium slender, hairs usually numerous below

node; leaf narrow, medium dark green, ligule present, occasional hair on leaf margin; panicle equilateral, medium to long (14–19 cm), wide (7–8 cm); rachis straight; nodes 4–6, false node absent; branches (20–28) short, straight to drooping; spikelets 22–36; glumes white to very light red, midlong (21–23 mm), fine in texture; florets 2; lemma dark brown to black with lighter grayish tip, short to medium (15–16 mm); nerves 7, prominent; palea midwide, black or dark brown; spikelet separation by semiabscission to heterofracture, basal scar prominent to obscure, pubescence numerous and long, floret separation usually by heterofracture; awns straight, usually present on lower floret; kernel midplump; rachilla segment long (2–2.25 mm) and slender, nonpubescent; no hairs on lemma.

Fulwood C.I. 6584

Description.—Juvenile growth intermediate to decumbent; culm medium stout and pink colored, numerous hairs on sheath and leaf; leaf narrow, leaves frequently tinged with pink.

Adult plant.—Midlate; midtall (104–122 cm); culms 1–4, medium stout, hairs on node absent to numerous both above and below; leaf midwide, medium dark green, ligule present, hairs absent to few on sheath and leaf margin; panicle equilateral, short to medium long (12–15 cm), narrow to medium wide (8–10 cm); rachis straight to flexuous; nodes 5–6, false node absent; branches (9–25) short to medium in length, straight to raised; spikelets 11–38; glumes red, midlong (20–23 mm), coarse in texture; florets 2–3; lemma red, short to medium long (15–17 mm); nerves 7, prominent; palea wide, yellowish to red; spikelet separation by fracture, basal scar absent to obscure; occasional medium long basal hair present, floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment very short and wide, pubescence absent to occasional; no hairs on lemma.

Golden C.I. 6760

Description.—An unusual oat with a very light yellowish-green plant color—hence its name “Golden.” Juvenile growth upright; culm medium stout, hairs on sheath or culm absent; leaf light yellowish green, medium wide, occasional hair on leaf margins.

Adult plant.—Midearly; short to midtall (81–125 cm); culms 3–5, medium stout, occasional hairs above and below nodes; leaf midwide, ligule present, unusual yellowish green, few hairs on leaf margin or sheath; panicle equilateral, midlong (17–28 cm), and wide; rachis straight to flexuous and recurved; nodes 5–7, false node absent; branches (12–19), midlong, usually raised in attitude;

spikelets 16–26; glumes yellow to reddish yellow, midlong (22–23 mm), medium to coarse in texture; florets 2; lemma reddish yellow, short to midlong (14–18 mm); nerves 5–7; obscure; palea narrow, yellow to reddish yellow; spikelet separation by fracture, basal scar absent to very obscure with occasional short basal pubescence; floret separation by heterofracture or fracture, distal; awns numerous, twisted, and geniculate; kernel slender; rachilla segment midlong and slender, nonpubescent; no hairs on lemma.

Hairy Culberson C.I. 2505

Description.—Juvenile growth decumbent to medium upright; culm medium stout, pubescence numerous on culm, sheath, and leaf margin; leaf medium narrow, plant color medium dark green.

Adult plant.—Medium early; medium to tall (119–135 cm); culms 3–5, medium stout, pubescence on nodes numerous above, few below; leaf medium wide, ligule present, pubescence on sheath and leaf absent to few; panicle equilateral, medium long (15–22 cm), and wide; rachis straight to recurved; nodes 5–7, false node absent; branches (12–23), long, straight to drooping; spikelets 14–34; glumes white, long (19–26 mm), fine in texture; florets 2; lemma gray, midlong (16–17 mm); nerves 7; palea midwide, gray; spikelet separation by fracture to abscission, basal scar absent to obscure to prominent, pubescence occasional short to midlong; floret separation by heterofracture; awns numerous, twisted and geniculate; kernel midplump; rachilla segment midlong, slender to medium wide, occasional short pubescence present; no hairs on lemma.

Hajira C.I. 1001

Description.—Juvenile growth upright; culm medium stout; leaves midwide, medium dark green; pubescence absent on sheath and leaf.

Adult plant.—Midearly; midtall (109–129 cm); culms 2–3, midstout with none or occasional hair above and below nodes; leaf midwide, ligule present, medium dark green, sheath and leaf nonpubescent; panicle equilateral, midlong (15–20 cm), and midwide; rachis straight to flexuous, slender, often recurved at tip; nodes 4–6, false node absent; branches (11–20) midlong, straight to drooping; spikelets (20–40); glumes white, midlong (20–25 mm), fine in texture; florets 2–3; lemma white to light grayish, midlong (16–18 mm); nerves 7; palea midlong and narrow, yellowish white; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, short to midlong; floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel

slender; rachilla segment variable short to long, slender, usually nonpubescent, but occasional short hairs present; no hairs on back of lemma.

Kareela C.I. 2774

Description.—Juvenile growth upright; culm medium stout; leaf medium wide, slight or no pubescence on leaf or sheath; plant medium dark green.

Adult plant.—Medium early; medium tall (102–117 cm); culms 2–3, medium stout, nodes very pubescent both above and below; leaf medium wide, drooping, ligule present, few or no pubescence on leaf sheath or margins; panicle equilateral, short to medium long (10–18 cm), medium to wide; rachis straight to flexuous and recurved; nodes 4–6, false node absent; branches (15–25), usually long, usually straight to raised; spikelets 20–40; glumes light red to red, long (21–30 mm), usually coarse in texture; florets 2–3; lemma red to grayish red, long (18–21 mm); nerves 7; palea medium narrow, grayish red; spikelet separation by fracture, basal scar obscure to absent, pubescence few, usually long; floret separation by fracture, basal or heterofracture; awns numerous, straight to twisted and geniculate; kernel slender; rachilla segment medium long, slender to midwide, pubescence usually absent, but occasional long hair present; no hairs on lemma.

Landhafer C.I. 3522

Description.—Juvenile growth intermediate to upright; culm diameter medium stout; numerous hairs on sheath and leaf margins; leaf medium wide and medium dark green.

Adult plant.—Midlate; tall to very tall (132–168 cm); culms 1–5, medium stout, slightly pink, very pubescent above and below nodes; leaf narrow, ligule present, occasional pubescence on sheath and leaf margin; panicle equilateral, midlong (18–20 cm), medium wide; rachis straight to recurved; nodes 5–7, false node absent; branches (14–21) medium long and usually drooping; spikelets (18–30); glumes reddish, somewhat striped, long (26–34 mm), coarse in texture; florets 2; lemma red, long (16–21 mm); nerves 7, prominent; palea narrow to midwide, red with gray flecks; spikelet separation usually by abscission with prominent basal scar, basal hairs numerous, long, floret separation usually by basifracture; awns absent; kernel slender to medium plump; rachilla segment long and slender, occasional short pubescence; occasional long hairs on lemma.

Lemont C.I. 4080

Description.—Juvenile growth decumbent; culm stout, numerous hairs on sheath; leaf narrow; few hairs on lower leaf margin; plant color light green.

Adult plant.—Late; tall (124–152 cm); culms 2–5, stout, very pubescent above and below node; leaf narrow, ligule present, numerous hairs on sheath and leaf margins, leaf color light green; panicle equilateral, long, and medium wide; rachis straight to flexuous and recurved; nodes 5–7, false node absent; branches (14–26) medium long, straight to drooping; spikelets 18–38; glumes white to reddish yellow, midlong (21–27 mm), medium coarse in texture; florets 2–3; lemma light red, medium long (17–19 mm); nerves 7; palea midwide, red; spikelet separation by fracture to semiabscission, obscure basal scar, basal pubescence absent, floret separation by heterofracture; awns numerous, straight to twisted, geniculate; kernel midplump; rachilla segment medium in length and width, nonpubescent; no hairs on lemma.

Navarro or Ferguson Navarro C.I. 966

Description.—Juvenile growth extremely decumbent; culm medium stout, few hairs on sheath, culm or leaves; leaf distinctly glaucous.

Adult plant.—Midearly; short (75–98 cm); culms 2–3, stout, few hairs above and below nodes; leaf medium wide, ligule present, plant distinctly glaucous; panicle equilateral, short (12–17 cm), medium wide; rachis straight; nodes 3–5, false node absent; branches (10–17) stout, short, and usually raised; 13–21 spikelets; glumes reddish, very glaucous, medium long (22–26 mm), medium to coarse in texture; florets usually 3; lemma yellow to yellowish red, midlong (17–18 mm); nerves usually 5, prominent; palea wide, reddish in color; spikelet separation by fracture, base very blunt, none or very obscure scar, nonpubescent, floret separation by heterofracture or fracture distal; awns occasional, straight; kernel very plump; rachilla segment very short and extremely wide, nonpubescent; no hairs on lemma.

Norline C.I. 6903

Description.—Juvenile growth very decumbent; culm stout; leaf medium narrow, sheath and leaf margins medium to very pubescent; plant color medium dark green.

Adult plant.—Medium late; tall (140–145 cm); culm stout, pubescence on node few to absent; leaf medium narrow, ligule present,

pubescence numerous on sheath, few to none on leaf margins, plant color medium dark green; panicle equilateral, medium long (15–25 cm), medium wide (7–9 cm); rachis straight to slightly flexuous; nodes 5–6, false node absent; branches (9–15) long, straight to raised; spikelets 20–26; glumes light red, midlong (21–26 mm), coarse in texture; florets 2–3; lemma light reddish yellow, medium to long (15–20 mm); nerves 7; palea midwide, light red; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, short, floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel midplump; rachilla segment long (2.5–2.75 mm), medium wide to slender, numerous short hairs present; no hairs on lemma.

Norwin C.I. 8018

Description.—Juvenile growth medium decumbent; culm mid-stout; slight or no pubescence on sheath or leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; short (70–75 cm); culms 4–5, midstout; nodal pubescence absent; leaf midwide, ligule present, medium dark green, slight or no pubescence on sheath or leaf; panicle midlong (14–16 cm), midwide; rachis straight; nodes 5–6, false node absent; branches 14–15, midlong, raised to straight; spikelets 14–17; glumes red, midlong (20–22 mm), medium in texture; florets 2; lemma reddish gray, midlong (16–17 mm); nerves 7; palea midwide, grayish red, spikelet separation by fracture; basal scar absent, very obscure; basal pubescence absent to occasional, midlong; floret separation by fracture; usually distal; awns absent; kernel midplump; rachilla segment midlong and midslender, nonpubescent; no hairs on back of lemma.

Nysel C.I. 5364

Description.—Juvenile growth very decumbent; culm very stout; leaf narrow; pubescence extremely numerous on sheath and leaf margins; present also on back of leaf; plant color medium dark green.

Adult plant.—Very late; tall (135–147 cm); culms 3–6, medium to slender, pubescence occasional to numerous both above and below nodes; leaf narrow, ligule present, medium long, very drooping; hairs numerous on sheath and leaf margin; panicle equilateral, long (15–25 cm), widespread; rachis long, straight to recurved, somewhat flexuous; nodes 7–8, false node absent; branches (25–30), medium long, often raised, but usually straight to drooping; spikelets numerous (30–34); glumes usually white, long (20–22 mm),

fine in texture; florets usually 2; lemma gray, medium long (16–18 mm), medium wide; nerves 7, prominent; palea narrow to midwide, gray; spikelet separation usually by fracture, basal scar absent to obscure, pubescence absent to occasional, floret separation usually by basifracture; awns absent to occasional subgeniculate; kernel usually midplump; rachilla segment short, very slender, occasional short hair present; occasional hairs on lemma.

Pentagon C.I. 2499

Description.—Juvenile growth variable, decumbent to very decumbent; culm stout, few to numerous hairs on sheath; leaf narrow, margins slightly to very pubescent; color medium light green.

Adult plant.—Somewhat variable in most morphologic characters; medium late; medium to tall (120–145 cm); culms 2–5, medium stout, hairs few to numerous above and below node; leaf medium wide, plant color medium light green, ligule present, hairs numerous on sheath and leaf margins; panicle equilateral, medium long (15–25 cm), and medium wide; rachis straight to somewhat flexuous; nodes 4–7, false node absent; branches (15–25) medium long, straight to somewhat drooping; spikelets 20–40; glumes reddish white, midlong (20–25 mm), medium to coarse in texture; florets 2–3; lemma red to grayish red, midlong to long (17–22 mm); nerves 5–7, medium to prominent; palea midwide, red to grayish red; spikelet separation by fracture, basal scar absent to obscure, pubescence few to absent, floret separation by fracture, distal to heterofracture; awns occasional to few, straight to subgeniculate; kernel midplump to plump; rachilla segment medium long, medium wide to slender, nonpubescent; no hairs on lemma.

Pioneer C.I. 3427

Description.—Juvenile growth very decumbent; culm stout, pubescence numerous on sheath and leaf margins; leaf narrow; plant color medium green.

Adult plant.—Very late; tall (130–145 cm); culms 2–4, stout, pubescence occasional to few above and below nodes; leaf narrow, ligule present, few hairs on sheath and leaf margins; panicle equilateral, long (20–30 cm), and wide; rachis long, flexuous, medium to slender, recurved; nodes 4–9, false node absent; branches numerous (18–28), long, slender, drooping; spikelets usually numerous (25–65); glumes white to reddish, long (20–24 mm), fine in texture; florets 2–3; lemma medium dark gray, midlong (18–20 mm); nerves 7, prominent; palea midwide, gray; spikelet separa-

tion by fracture, basal scar usually absent to obscure, basal pubescence occasional to few, midlong to short; floret separation by heterofracture; awns few to numerous, straight, subgeniculate to twisted and geniculate; kernel medium to slender; rachilla segment long, slender with occasional short pubescence; no hairs on lemma.

Quincy Gray C.I. 4078

Description.—Juvenile growth semidecumbent to decumbent; culm very stout, numerous hairs on sheath, leaves midwide, hairs very numerous on margins, plant color medium dark green, slightly pink.

Adult plant.—Medium early; midtall (125–132 cm); culms 2–6, stout, numerous hairs above and below node; leaf medium wide, ligule present, hairs on sheath and leaf absent to few; panicle equilateral, medium long (15–25 cm), medium to wide; rachis straight to flexuous, often recurved; nodes 5–6, false node absent; branches usually 10–15, short to medium long, straight, raised to drooping; spikelets usually less than 20; glumes red to light red, long (25–30 mm), coarse in texture; florets 2–3; lemma red, to grayish red, medium to long (18–22 mm); nerves 7; palea midwide, red; spikelet separation by fracture to semiabscission, basal scar absent to prominent, usually obscure; basal hairs absent to few, short to long; floret separation usually by heterofracture; awns few to numerous, straight to twisted, geniculate; kernels plump; rachilla segment short to medium long, slender to medium wide, pubescence few, short to medium long; no hairs on lemma.

Quincy Red (Quincy 1) C.I. 4077

Description.—Juvenile growth semidecumbent; culm stout, few hairs on sheath; leaf medium wide, few to no hairs on margin; plant color medium light green.

Adult plant.—Medium early; short to midtall (90–115 cm); culms 2–3, medium stout, nodes nonpubescent; leaf medium wide, ligule present, occasional hairs on sheath and leaf margin; panicle equilateral, medium long (20–25 cm), midwide; rachis straight to somewhat flexuous; nodes 4–6, false node absent; branches (12–20) short, straight to somewhat raised; spikelets 16–30; glumes red, short to midlong (18–24 mm), medium coarse in texture; florets usually 2, sometimes 3; lemma red to grayish red, midlong (15–17 mm); nerves 7, prominent; palea midwide, grayish red; spikelet separation usually by fracture, basal scar absent to very obscure,

basal hairs absent to occasional, long, floret separation by fracture, distal or heterofracture; awns usually numerous, straight to subgeniculate on lower floret; absent on second floret; kernel plump; rachilla segment short, wide, nonpubescent; no hairs on lemma.

Rangler C.I. 3733

Description.—Juvenile growth medium decumbent; culm stout; no pubescence on sheath or leaf; leaf medium dark green.

Adult plant.—Midlate; tall (96–130 cm); culms 2–4; occasional pubescence above and below nodes; leaf midwide, ligule present, medium dark green, occasional hair on sheath and leaf margin; panicle equilateral, short to midlong (10–15 cm), and midwide; rachis straight to somewhat flexuous; nodes 5–7, false node absent; branches 14–22, midlong, straight to raised in attitude; spikelets 22–29; glumes red, long (27–29 mm); coarse in texture; florets 2–3; lemma red, midlong (18–19 mm); nerves 7; palea midwide, red; spikelet separation by fracture to semiabscission, basal scar prominent to obscure, basal pubescence present, long; floret separation by fracture; usually basal; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment short, wide, with occasional hair present; no hairs on back of lemma.

Red Algerian C.I. 840

Description.—Juvenile growth medium to decumbent; culm very stout, hairs on culm or sheath absent; leaf medium wide, few hairs on margin; plant color medium light green, slightly red.

Adult plant.—Midseason; midtall (98–132 cm); culms 2–5, stout, few hairs above and below nodes; leaf medium wide, ligule present, pubescence absent to few on sheath and leaf; panicle equilateral, medium long (15–25 cm) and widespread; rachis slender, straight to recurved; nodes 5–6, false node absent; branches (17–23) short to medium long, slender, usually drooping; spikelets 10–29; glumes reddish, long (20–33 mm), coarse in texture; florets 2–3; lemma red to grayish red, midlong (18–22 mm); nerves 6–7; palea midwide, grayish red; spikelet separation usually by abscission to semiabscission, basal scar usually very prominent, wide, basal hairs numerous, very long, floret separation usually by basifracture; awns numerous, straight; kernel midplump; rachilla segment medium to long, slender, medium to stout, pubescence usually absent; hairs on back of lemma, occasional, long.

Ruakura C.I. 2025

Description.—Juvenile growth intermediate; culm stout; few hairs on sheath and leaf margins; leaf midwide; plant color medium dark green.

Adult plant.—Very early; short to midtall (73–130 cm); culms 2–3, medium stout, hairs on nodes numerous, long; leaf midwide, ligule present, hairs numerous on sheath, few on margin; panicle equilateral, midlong (17–24 cm); rachis straight to flexuous; nodes 5–6, false node absent; branches (20–26) usually short, slender, straight to drooping; spikelets 21–35; glumes red to reddish white, midlong to long (22–27 mm), coarse in texture; florets 2; lemma gray or streaked with gray, midlong (18–21 mm); nerves 5–7, prominent; palea midwide, light gray to gray; spikelet separation usually by fracture, basal scar absent to obscure, basal pubescence occasional, long, floret separation by heterofracture; awns numerous, twisted and geniculate; kernel slender; rachilla segment medium to long, slender, pubescence occasional, very short, no hairs on lemma.

Santa Fe C.I. 7006

Description.—Juvenile growth decumbent; culm medium slender, sheath and leaf margins slightly pubescent; leaf medium narrow, medium dark green.

Adult plant.—Medium late; tall (150–160 cm); culms 2–3, slender, pubescence numerous below nodes; leaf medium narrow; ligule present, medium dark green; pubescence slight on sheath and leaf margins; panicle equilateral, midlong (17–20 cm) and midwide (8–10 cm); rachis slender, slightly flexuous, recurved at tip; nodes 6–7, false node absent; branches (16–20) midlong (10–12 cm), slender, and drooping; spikelets 19–25; glumes light red, midlong (25–27 mm), fine in texture; florets 2, separation by fracture, usually distal; basal scar absent to obscure; basal pubescence absent, lemma white to yellow tinged with gray; short to medium (16–17 mm); nerves 7, prominent; palea narrow, gray; awns numerous, usually straight to slightly subgeniculate; kernel medium slender; rachilla segment long (2–2.5 mm), slender, nonpubescent; no hairs on back of lemma.

Santa Fe Selection C.I. 5844

Very similar to Santa Fe C.I. 7006 except C.I. 7006 is slightly taller, has slightly lighter colored lemmas, and often has a few more awns.

Segetal C.I. 2137

Description.—Juvenile growth semidecumbent; culm midstout; pubescence present on sheath and leaf; plant color light green.

Adult plant.—Late; midtall (100–110 cm); culms 2–3, midstout; nodal pubescence present below node, leaf midwide, ligule present, light green; slight pubescence on sheath and leaf margin; panicle equilateral, midlong (16–25 cm), and wide (8–15 cm); rachis straight to flexuous; nodes 5–8, false node absent; branches 17–31, midlong to long, straight to drooping; spikelets numerous, 20–60; glumes white, long (22–25 mm), medium in texture; florets 2; lemma grayish red, midlong (18–20 mm); nerves 7, prominent; palea gray to reddish gray; spikelet separation by fracture, basal scar obscure to absent, basal pubescence present, midlong to long; floret separation by fracture, distal to heterofracture; awns present, numerous, straight to subgeniculate; pubescence present on lower portion of awn; kernel midplump; rachilla segment midlong, slender, pubescence absent to slight, short to long; none to few long hairs on back of lemma.

Stanton C.I. 3855

Description.—Juvenile growth decumbent; culm very stout; pubescence very numerous on sheath and leaf margins; leaf midwide, medium dark green.

Adult plant.—Medium late; midtall to tall (114–132 cm); culms 1–5, medium to stout, pubescence occasional above and below nodes; leaf medium wide, dark green, ligule present, some hairs on sheath and leaf margin; panicle equilateral, midlong (15–22 cm), medium to wide; rachis straight to recurved, somewhat flexuous; nodes 5–6, false node absent; branches (10–22) medium long, straight to drooping; spikelets 13–35; glumes slightly reddish, medium long (22–25 mm), coarse in texture; florets 2–3; lemma red to yellow, short to midlong (15–17 mm); nerves 7; palea midwide, red to reddish yellow; spikelet separation by fracture, basal scar absent to obscure, nonpubescent, floret separation by heterofracture; awns occasional, straight; kernel slender to midplump; rachilla segment short and wide with occasional very short to medium long pubescence; no hairs on lemma.

Sterisel C.I. 2891

Description.—Juvenile growth semidecumbent; culm midstout; occasional hairs on sheath and leaf margin; leaf midwide, medium dark green.

Adult plant.—Midlate; midtall (120–138 cm); culms 2–4, midstout; nodal pubescence numerous below, few or none above; leaf mid-narrow, dark green, occasional pubescence on sheath and leaf margin; panicle equilateral, midlong (22–25 cm), midwide; rachis slender, slightly flexuous, recurved; nodes 5–6, false node absent; branches 21–24, very long, slender, drooping; spikelets 22–42; glumes reddish, midlong (26–28 mm), intermediate to coarse in texture; florets 2–3, lemma dark brown to black with white tip, midlong (20–21 mm); nerves 5–7, palea midwide, brown to black; spikelet separation by fracture, basal scar absent; floret separation by basifracture; awns usually present on lower floret, twisted, geniculate; kernel midplump; rachilla segment medium slender; pubescence variable, absent to numerous, midlong; occasional hairs on back of lemma.

Sturdy C.I. 5117

Description.—Juvenile growth decumbent; culms stout, few to numerous long hairs on sheath and lower margins of leaf; leaf narrow to medium wide; color medium dark green.

Adult plant.—Midlate; short to midtall (81–124 cm); culms 2–5, stout, numerous hairs above and below nodes; leaf narrow, medium dark green, ligule present, little or no pubescence on sheath and leaf; panicle equilateral, midlong (10–25 cm), narrow; rachis straight to flexuous; nodes 4–6, false node absent; branches (10–20), short to very short, usually stout and raised; spikelets 9–28; glumes reddish white, midlong (18–23 mm), coarse in texture; florets 2–3; lemma grayish red, short to midlong (15–17 mm); nerves 7, prominent; palea wide, gray; spikelet separation by fracture, basal scar absent to obscure, nonpubescent, floret separation by heterofracture to fracture, distal; awns occasional, straight; kernel very plump; rachilla segment short and wide, occasional short to medium long hairs present; hairs on back of lemma usually absent, but occasional long hair observed.

Sunland C.I. 6600

Description.—Juvenile growth semidecumbent to upright; culm stout, often colored pink; hair on sheath absent, occasional hair on lower leaf margin; color medium light green.

Adult plant.—Midearly; midtall to tall (107–132 cm); culms 2–6, stout, occasional pubescence above and below nodes; leaf medium wide, medium light green, ligule present, occasional hair on sheath and leaf margin; panicle equilateral, medium long (12–20 cm), medium wide; rachis straight to flexuous; nodes 4–6, false node

absent; branches (9–21) medium long, straight to drooping; spikelets 12–30; glumes red, long (24–30 mm), coarse in texture; florets 2–3; lemma red to grayish red, long (18–20 mm); nerves 7; palea wide, red to grayish red; spikelet separation usually fracture, basal scar absent to obscure, pubescence occasional, short to long, floret separation by basifracture to heterofracture; awns occasional, straight; kernel plump; rachilla segment short and wide, occasional short hair present; no hairs on lemma.

Sunrise C.I. 982

Description.—Juvenile growth medium to upright; culm stout; pubescence on sheath and leaf margins absent; leaf midwide, plant color pink.

Adult plant.—Early; short to midtall (76–107 cm); culms 2–7, medium stout, hairs on nodes absent to occasional; leaf narrow to medium wide, medium light green, ligule present, no hairs on sheath or leaf; panicle equilateral, midlong (11–15 cm), narrow to medium in width; rachis straight to recurved; nodes 4–6, false node absent; branches (10–15), short, straight to raised; spikelets 10–20; glumes red, medium long (21–24 mm), coarse in texture; florets usually 2; lemma red, short to midlong (15–17 mm); nerves 5–7; palea wide, red, flecked with gray; spikelet separation by fracture, obscure basal scar, pubescence occasional, long, floret separation by heterofracture; awns numerous, twisted and geniculate; kernels plump; rachilla segment short to medium long and medium to wide, nonpubescent; no hairs on lemma.

Suwannee C.I. 4797 (Blackhull)

Description.—Juvenile growth usually upright; culm medium stout, pubescence absent on sheath and leaf; leaf narrow; color medium dark green.

Adult plant.—Early; short to midtall (80–115 cm); culms 2–3, medium stout, no pubescence at nodes; leaf medium narrow, medium dark green, ligule present, sheath and leaf nonpubescent; panicle equilateral, medium long (10–20 cm), medium to wide; rachis straight to recurved; nodes 4–5, false node absent; branches (12–20) medium long and medium slender, straight to drooping; spikelets 15–25; glumes white to gray, midlong (20–26 mm), fine to coarse in texture; florets 2–3; lemma usually black, medium long (16–18 mm); nerves 7; palea medium narrow, black; spikelet separation usually by fracture, basal scar absent to obscure, pubescence few and usually short, floret separation by fracture, distal to

heterofracture; awns few, straight to twisted, geniculate; kernel slender to very slender; rachilla segment medium to long, slender to medium wide, pubescence absent; no hairs on lemma.

Tift C.I. 3752

Description.—Juvenile growth decumbent to intermediate; culm midstout; leaf midwide; slight to no pubescence on sheath or leaf; plant color medium light green.

Adult plant.—Midlate; midtall (90–115 cm); culms 2–5, midstout, often slightly red in color; few hairs above or below node; leaf midwide; medium light green, ligule present; occasional hair on leaf and sheath; panicle equilateral, midlong (15–20 cm), wide; rachis stiff, stout; nodes 4–6, false node absent; branches 15–16, short, slender; spikelets 15–20; glumes reddish, midlong to long (26–28 mm), medium coarse in texture; florets 2; lemma red; midlong (17–20 mm); nerves 7; palea midwide; red to grayish red; spikelet separation by semiabscission; basal scar intermediate; pubescence numerous, long; floret separation by heterofracture to basifracture; awns numerous, straight; kernel midplump; rachilla segment midlong, midwide, pubescence occasional, long; no hairs on back of lemma.

Traveler C.I. 4206

(A slightly variable oat both in height and maturity.)

Description.—Juvenile growth decumbent; culm and sheath somewhat pubescent, leaf midwide, medium dark green.

Adult plant.—Midlate; midtall (127–135 cm); culms 3–5, midstout, very light pink, nodal pubescence numerous above and below; leaf midwide, ligule present, medium dark green, slight pubescence on sheath and leaf margin; panicle equilateral, midlong (15–18 cm), midwide; rachis straight to slightly flexuous; nodes 6–7, false node absent; branches (12–15), midlong, medium stout, straight to somewhat raised; spikelets 14–18; glumes red, midlong (22–24 mm), medium to coarse in texture; florets 2; lemma grayish red to red, midlong (17–18 mm); nerves 7; palea midwide, grayish red; spikelet separation by fracture; basal scar absent to very obscure, pubescence absent; floret separation usually by fracture, distal to heterofracture; awns occasional, straight; kernel midplump; rachilla segment midlong, midwide, nonpubescent; no hairs on lemma.

Trispernia C.I. 7008 (1776 and 4009)

Description.—Juvenile growth intermediate; culm stout, pubescence absent on sheath and leaf; leaf narrow, plant color medium dark green, slightly pink.

Adult plant.—Medium early; tall (125–132 cm); culms 2–3, medium to slender, pubescence short, below node; leaf medium narrow, drooping, medium dark green, ligule present, pubescence absent to few on sheath or leaf; panicle equilateral, medium long (18–25 cm), and medium wide; rachis straight to slightly flexuous; 7 nodes, false node absent; branches (19–20) midlong, usually straight to raised; spikelets (20–26); glumes yellow to slightly red, midlong (24–25 mm), coarse in texture; florets 2; lemma light red, midlong (16–17 mm); nerves 7; palea narrow, yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent, floret separation by fracture, distal; awns few, straight to subgeniculate; kernel slender; rachilla segment long (2–2.5 mm), slender, few to numerous short hairs present; no hairs on lemma.

Ukraine C.I. 7007

Description.—Juvenile growth decumbent; culm medium stout, slightly pink; leaf narrow, few hairs on sheath, numerous hairs on leaf margins, color medium dark green.

Adult plant.—Medium late; tall (142–163 cm); culms 3–5, stout, often colored light red, hairs numerous, long above and below nodes; leaf medium wide, medium dark green, ligule present, few hairs on sheath and few on leaf margin; panicle equilateral, long (20–30 cm), medium to wide; rachis medium slender, slightly flexuous and recurved; 7 or more nodes, false node absent; branches (19–21 or more), long (12–15 cm), slender, raised, straight to drooping; spikelets numerous, 47–50; glumes light red, slightly glaucous, midlong (22–23 mm), fine in texture; florets 2; lemma white to yellowish white, midlong to long (18–21 mm); nerves 7, barbed near tip ends; palea narrow, light yellow; spikelet separation usually by fracture, basal scar absent to obscure, pubescence few, very short, floret separation by fracture, distal or heterofracture; awns absent to occasional, straight; kernel slender; rachilla segment medium in length, slender, nonpubescent; no hairs on lemma.

Ventura C.I. 3989

Description.—Juvenile growth upright; culm medium to slender; pubescence absent on sheath and leaf; young stem sometimes reddish colored; plant medium dark green.

Adult plant.—Early; short (85–92 cm); culms 2–4, pubescence absent above and below nodes; leaf midwide, ligule present, no hairs on sheath or leaves; medium dark green; panicle equilateral, short (13–18 cm), and midwide; rachis straight to flexuous, often somewhat recurved at tip; nodes 4–6, false node absent; branches (14–18) midlong, straight to drooping; spikelets 16–27; glumes red, midlong (22–24 mm), medium fine in texture; florets 2–3; lemma reddish yellow, midlong (17–19 mm); nerves 7, obscure; palea midwide, reddish yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence occasional to few, long; floret separation by fracture, usually distal; awns occasional, straight; kernel medium to slender; rachilla segment midlong, slender, nonpubescent; no hairs on lemma.

Verde C.I. 4312

Description.—Juvenile growth medium decumbent to upright; culm midstout; pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midearly; short to midtall (71–114 cm); culms 2–7, pubescence absent above and below nodes; leaf medium wide, drooping, ligule present, pubescence absent on sheath and leaf margins; panicle equilateral, medium long (15–25 cm), and midwide (6–12 cm); rachis straight to often flexuous, slender and recurved; 4–6 nodes, false node absent; branches (usually 16–20), medium to long, straight to raised; spikelets 15–36; glumes red, occasionally light red to yellowish white, medium long (20–25 mm), medium coarse in texture; florets 2; lemma red, midlong to very long (16–23 mm); nerves 5–7; palea midwide, grayish red to red; spikelet separation usually by semiabscission, basal scar prominent, basal pubescence usually numerous, long, floret separation by basifracture, occasionally by heterofracture; awns numerous, straight; kernel midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Victoria C.I. 2401

Description.—Juvenile growth intermediate to decumbent; culm medium stout, often tinged slightly red, numerous hairs on sheath

and hairs very numerous on leaf margins; leaf narrow, plant color medium light green.

Adult plant.—Midlate; medium tall (75–120 cm); culms 2–5, medium stout, pubescence on sheath and nodes absent; leaf narrow, medium light green, ligule present, few hairs on leaf margins; panicle equilateral, medium long (18–26 cm), and often very wide (10–14 cm); rachis slender, straight to recurved; 4–6 nodes, false node absent; branches (15–20), long, slender, usually drooping; spikelets (11–30), few to numerous; glumes red, long (25–30 mm), coarse in texture; florets usually 3; lemma light red, long (19–21 mm); nerves 5–7, prominent; palea midwide, red often with pink tinge; spikelet separation by semiabscission to fracture, basal scar prominent to obscure, or even absent, basal pubescence few, long, floret separation by heterofracture; awns numerous, subgeniculate to twisted and geniculate; kernel midplump; rachilla segment short to medium long, medium wide, few short to medium long hairs present; no hairs on lemma.

Winter Fulghum C.I. 2500

Description.—Juvenile growth decumbent, culm stout, few to numerous hairs on sheath; leaf midwide, margins slightly pubescent; color medium dark green.

Adult plant.—Medium late; medium tall (127–145 cm); culms 2–5, stout, hairs on nodes few to numerous above and below; leaf medium wide, medium dark green, ligule present, hairs numerous on sheath and leaf margins; panicle equilateral, medium long (22–25 cm), and medium wide; rachis straight to flexuous; 6–7 nodes, false node absent; branches (14–26), medium long, straight to somewhat drooping; spikelets 24–40; glumes reddish white, midlong (22–24 mm), medium fine in texture; florets usually 2; lemma red to grayish red, midlong (16–17 mm); nerves 7, medium to prominent; palea midwide, grayish red; spikelet separation by fracture to semiabscission, basal scar absent to obscure; basal hairs usually absent; floret separation by fracture, distal to heterofracture; awns occasional, straight; kernel medium to plump; rachilla segment medium long, medium wide, but tapered; pubescence absent to occasional, short; no hairs on lemma.

Woodgrain C.I. 7707

Description.—Juvenile growth decumbent; culm very stout, reddish in color; pubescence numerous on sheath, absent on leaves; leaf midwide to narrow; medium dark green.

Adult plant.—Midearly; medium in height (105–110 cm); culms 2–3, medium stout, hairs numerous above and below nodes; leaf medium to narrow, ligule present, few to numerous hairs on sheath and leaf margins, plant medium dark green; panicle equilateral, medium long (18–25 cm), and medium wide; rachis straight to slightly flexuous; 5–6 nodes, false node absent; branches (17–22) short to midlong (6–10 cm), straight to raised; spikelets 28–33; glumes light red, midlong (21–22 mm), medium coarse in texture; florets usually 2–3; lemma very light red, short (15–16 mm); nerves 7; palea wide, very light red; spikelet separation by fracture, basal scar absent to obscure, few long basal hairs present, floret separation by heterofracture; awns absent to very occasional, straight; kernel very plump; rachilla segment midshort (1.5–1.75 mm), wide, pubescence absent; no hairs on lemma.

SPRING-SOWN COMMON OAT VARIETIES IN THE UNITED STATES

The history of oats indicates that they have been grown by man for at least 2,000 years. Originally they were primarily a crop for warmer climates and, as such, were presumably largely fall sown. In the past 2,000 years their culture has moved northward, resulting in the evolution of spring oats from the more or less diverse previously grown winter oat types.

Today, both in Europe and North America the predominant acreage of the crop is spring sown. In the United States more than 80 percent of oats grown are spring sown, and the varieties of that type are far more numerous than those fall sown.

Progenitor or “standard” varieties for all spring-sown oats were established in the 1920’s and are listed in table 5.

All spring-sown oats in the United States are hexaploids. Morphologically, they can be divided into three groups: (1) *Avena byzantina* K. and *Avena sativa* L. (spreading panicles) (tables 6 and 7), (2) *Avena sativa* ssp. *orientalis* Schreb. (side panicles) (table 8), and (3) *Avena nuda* L. (hull-less oats) (table 9).

Varieties in each of the groups are discussed separately. More than 90 percent of the commercial oat varieties are included in group one.

Spring-Sown "Tree Panicle" Oats

Two types of oats are included in this group: (1) *Avena sativa* L. and (2) *Avena byzantina* Koch. In the past 40 years in the United States, extensive hybridization between oats of these two species has taken place. This has resulted in difficulty in differentiating morphologically these new varieties in numerous cases.

The primary reason for this hybridization has been that desirable genes for resistance to diseases, especially the crown rusts, were originally found much more frequently in oats of the *Avena byzantina* than in those of the *A. sativa* species.

One predominantly used character in the differentiation of the two species is the mode of separation of the second (upper) from the first (lower or supporting) floret of the spikelet. If separation by fracture takes place at the upper end of the connecting rachilla segment (distal) and the rachilla segment remains attached to the lower (primary) floret, the oat is classed as *Avena sativa*. If separation by fracture takes place at or near the base of the rachilla segment and most of it remains with the second or upper floret at separation, the oat is considered as belonging to *Avena byzantina*.

The problem in classification is, however, that in progeny from crosses between parents, one of which is an *A. sativa* and one an *A. byzantina* oat, numerous variations in mode of separation are observed in different progeny of the same cross. Only on close examination of numerous spikelets and florets can a reasonably accurate decision as to species be made.

In this publication the descriptions are presented, but no attempt has been made to designate or separate spring oat varieties into the two groups: *Avena byzantina* or *Avena sativa*.

Information on spring oats having spreading (tree-type) panicles has been divided into three groups:

- (1) Standard registered
- (2) Improved registered
- (3) Not registered varieties.

Descriptions of groups (1) and (2) are included together, without any separation of the two. Information on registered oats of this type is being presented first. Information on spring-sown oats (group 3) not registered will follow.

Spikelets and florets of the important registered varieties of spring-sown oats are shown in figure 25.

TABLE 5.—*History of old progenitor or standard registered spring-sown oat varieties in the United States (in order of registration number)*

Variety	C.I. No. ¹	Reg. No.	Year selected, introduced, or named	Individual or agency that produced or released variety	Source	Parental oat or original geographic source
Belyak	----- 1630	5	1904	Received by USDA from Moscow, Russia.	Russia	Selected from Swedish Select.
Black Diamond	----- 1878	6	-----	Received by USDA from W. C. Etheridge, Univ. of Missouri.	Missouri	Source unknown.
Black Mesdag	----- 1877	7	1870	Vilmorin-Andrieux et Cie Seed Co. of France.	France	Selected in Netherlands from Black President.
Black Norway	----- 1874	8	1907	Received by USDA from Swedish Plant Breeding Station, Svalöf, Sweden.	Sweden	Selected from old Swedish black oat.
Canadian	----- 1625	9	1850 ²	Same original source as above, received in United States from Canada.	Sweden	Probably reselected from Potato oat of England.
Danish Island	----- 1684	11	1895	Swedish Plant Breeding Station, Svalöf, Sweden.	Sweden	Same as Probesteier from Danish Islands.

Early Champion -----	1623	12	1894	Frank S. Fowler, Iowa farmer	-----	Iowa	Selected from Burpee's Choice and Fourth of July.
Early Mountain -----	1624	13	1901 ²	John Yeggen, North Dakota farmer		North Dakota	Introduced from Bavaria, Germany.
Garton No. 5 -----	1311	14	Late 1930's.	Garton's Ltd., Warrington, England		England	Cross between Storm King and unknown variety.
Garton No. 473 -----	1883	15	-----	Garton's Ltd., Warrington, England		England	Cross between Storm King and unknown variety.
Golden Rain -----	1890	16	1892	Hjalmar Nilsson, Swedish Plant Breeding Station, Svalof, Sweden.		Sweden	Selected from Probesteier (old Milton oat), originally from Baltic region of Europe.
Gothland -----	1898	17	1890 ²	Unknown	-----	Sweden	Probably introduced into Canada from Sweden, and then into the United States.
Green Russian -----	1978	18	1870 ²	Introduced presumably from Russia by U.S. immigrants to northern Minn. and N.Dak.		Minnesota North Dakota	Russia.

See footnotes at end of table.

TABLE 5.—*History of old progenitor or standard registered spring-sown oat varieties in the United States (in order of registration number)*—Continued

Variety	C.I. No. ¹	Reg. No.	Year selected, introduced, or named	Individual or agency that produced or released variety	Source	Parental oat or original geographic source
Irish Victor	-----	19	1900	Introduced by Iowa Seed Company, Des Moines, Iowa.	Iowa	Presumably from Ireland.
Japan	-----	20	1885 ²	Introduced by a Rochester, N.Y., Seed Co.	New York	Claimed to be developed at their Burr-Oas Farm, Sibley, Ill.
Joanette	-----	21	1888 ²	Introduced by Ontario Agr. College, Guelph, Canada, from France.	France	France.
Kherson	-----	22	1896	Introduced by Nebr. Agr. Expt. Sta. from southern Russia.	Nebraska	Russia.
Lincoln	-----	23	1894	Introduced by Northrup, Braslan & Goodwin Seed Co.	Minnesota	Unknown.
Madrid	-----	24	1909	Introduced by USDA from A. Ramirez, Madrid.	Spain	Madrid, Spain.
Monarch	-----	25	-----	Probably introduced into United States by immigrants from Europe.	Upper Mississippi Valley States.	Unknown.

North Finnish -----	1882	26	-----	Introduced from Finland apparently by Finnish immigrants to Northern United States.	-----	Finland.
Old Island Black -----	1756	27	-----	Presumably introduced into the United States via Prince Edward Island of Canada.	Canada	Possibly England.
Awnless Probesteier -----	1888	28	1892	Introduced into United States by USDA in 1907.	Sweden	Selected from Probesteier at Swedish Plant Breeding Station, Svalöf, Sweden.
Scottish Chief -----	1699	29	1885	Introduced from Scotland as early as 1885 by J. A. Everitt & Co., Indianapolis, Ind.	Scotland	Scotland.
Silvermine -----	1013	30	1895	Introduced by John A. Salzer Seed Co. of La Crosse, Wis.	Wis.	Unknown (previous name Nameless White Beauty).
Swedish Select -----	134	31	1898 ²	Introduced by M. A. Carleton, USDA, from St. Petersburg, Russia.	Russia	Believed to be selected from Ligowo. Apparently introduced from Sweden into Finland and then into Russia.

See footnotes at end of table.

TABLE 5.—*History of old progenitor or standard registered spring-sown oat varieties in the United States (in order of registration number)*—Continued

Variety	C.I. No. ¹	Reg. No.	Year se- lected, intro- duced, or named	Individual or agency that produced or released variety	Source	Parental oat or original geographic source
Tobolsk	-----	1709	32	1899	Introduced by M. A. Carleton, USDA, from Tobolsk, Russia.	Russia.
Victor	-----	803	33	-----	Garton's Ltd., Warrington, England	A cross involving Abun- dance, Black Tartar, Goldfinder, and Winter Turf.

¹ C.I. numbers listed are those most commonly used. Several varieties have additional C.I. numbers.² Approximate date only.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Colburt -----	2019	43	1911(S)	W. G. Shelley	Burt -----	1924	Colo.	W. G. Shelley, Clyde McKee, C. H. Clark, Geo. McMurdo, F. A. Coffman.
Richland -----	787	44	1906(S)	L. C. Burnett	Kherson -----	1914	Iowa	L. C. Burnett, C. W. Warbur- ton.
State Pride --	1154	45	1907(S)	R. A. Moore	Kherson -----	1924	Wis.	R. A. Moore, B. D. Leith.
Albion -----	729	46	1906(S)	L. C. Burnett	Kherson -----	1913	Iowa	L. C. Burnett, C. W. Warbur- ton.
Gopher -----	2027	47	1917(S)	A. C. Army	Sixty Day (Kherson)	1923	Minn.	A. C. Army, H. K. Hayes.
Iowar -----	847	48	1910(S)	L. C. Burnett	Kherson -----	1919	Iowa	L. C. Burnett, C. W. Warbur- ton.
White Cross --	2026	49	1911(C)	B. D. Leith	Big Four × Sixty- Day.	1918	Wis.	B. D. Leith.
Cornellian ----	1242	50	1912(S)	H. H. Love	Canada Cluster ----	1920	N.Y.	H. H. Love, W. T. Craig.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Iogren	2024	51	1911(S)	L. C. Burnett	Green Russian	1922	Iowa	L. C. Burnett, C. W. Warburton.
Markton	2053	52	1911(S)	H. J. C. Umberger	C.I. 357	1924	Oreg.	H. J. C. Umberger, D. E. Stephens.
Colorado 37	1640	53	1900(S)	A. H. Danielson	Unknown commercial field in Colorado.	1924	Colo.	A. H. Danielson, Alvin Kezer.
Comewell	1317	54	1904(S)	J. B. Norton	Welcome	1912	N.Y.	H. H. Love, W. T. Craig.
Empire	1974	55	1912(S)	H. H. Love	Big Four	1918	N.Y.	H. H. Love, W. T. Craig.
Forward	2242	56	1911(S)	E. J. Delwiche	Silvermine	1919	Wis.	E. J. Delwiche.
Idamine	1834	57	1915(S)	C. W. Warburton	Silvermine	1921	Idaho	C. W. Warburton, L. C. Aicher, A. E. McClymonds.
Ithacan	2141	58	1914(S)	H. H. Love	National	1922	N.Y.	H. H. Love, W. T. Craig.
Minota	1285	59	1910(S)	A. C. Army	Unknown commercial field in Minnesota.	1925	Minn.	A. C. Army, H. K. Hayes.

Standwell	1975	60	1912(S)	H. H. Love	Lincoln	1918	N.Y.	H. H. Love, W. T. Craig.
Upright	2142	61	1914(S)	H. H. Love	American Beauty	1918	N.Y.	H. H. Love, W. T. Craig.
Wisconsin Wonder.	1645	62	1903(S)	R. A. Moore	White Bonanza	1922	Wis.	R. A. Moore, B. D. Leith, E. J. Delwiche.
Kanota	839	66	1916(R)	S. C. Salmon	Nicholson's New Extra Early Improved Red Rustproof.	1919	Kans.	S. C. Salmon, J. H. Parker, H. H. Laude.
Keystone	2146	68	1910(S)	C. F. Noll	Japan	1921	Pa.	C. F. Noll.
Patterson	2147	69	1910(S)	C. F. Noll	Japan	1920	Pa.	C. F. Noll.
Wolverine	1591	70	1911(S)	F. A. Spragg	Unknown commercial field in Michigan.	1917	Mich.	F. A. Spragg, H. M. Brown.
Worthy	1590	71	1906(S)	F. A. Spragg	Unknown commercial field in Michigan.	1911	Mich.	F. A. Spragg, H. M. Brown.
Iogold	2329	72	1906(S)	L. C. Burnett	Kherson	1927	Iowa	L. C. Burnett, C. W. Warburton.
Brunker	2054	73	1919(S)	F. A. Coffman	Burt	1929	Colo.	F. A. Coffman, T. R. Stanton, D. W. Robertson.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Rainbow	---	2345	74	1922(S)	T. E. Stoa	---	1929	N. Dak. T. E. Stoa.
Anthony	---	2143	75	1918(S)	R. J. Garber, H. K. Hayes.	White Tartar (White Russian) × Victory.	1929	Minn. H. K. Hayes, R. J. Garber.
Miami	-----	2245	76	1906(S)	C. G. Williams	Siberian	1912	Ohio C. G. Williams, L. E. Thatcher.
Wayne	-----	2567	77	1909(S)	C. G. Williams	Selected from a cross (identity lost).	1930	Ohio C. G. Williams, L. E. Thatcher, J. B. Norton.
Columbia	----	2820	78	1920(S)	L. J. Stadler	Fulghum	1930	Mo. L. J. Stadler, R. T. Kirk- patrick.
Franklin	----	2892	79	1922(S)	H. L. Borst	Fulghum	1931	Ohio H. L. Borst, G. H. String- field.
Lenroc	-----	3205	80	1918(C)	W. T. Craig	Great American × Cornellian.	1935	N.Y. H. H. Love, W. T. Craig.
Rusota	-----	2343	81	1922(S)	T. E. Stoa	Green Russian	1935	N.Dak. T. E. Stoa.

Spooner -----	3165	82	1913(S)	E. J. Delwiche	Wisconsin No. 8 (Sil-vermine type).	1924	Wis.	E. J. Delwiche.
Fulton -----	3327	84	1926(C)	G. A. Wiebe	Fulghum × Mark-ton.	1939	Kans.	J. H. Parker, F. A. Coffman, H. H. Laude, G. A. Wiebe.
Carleton ----	2378	85	1919(C)	T. R. Stanton	Sixty-Day × Mark-ton.	1937	Oreg.	T. R. Stanton, F. A. Coffman, B. B. Bayles, D. E. Stephens.
Bannock ----	2592	86	1923(C)	G. A. Wiebe	Markton × Victory.	1938	Idaho	T. R. Stanton, F. A. Coffman, H. Stevens, J. L. Toevs, G. A. Wiebe, L. L. Davis, A. E. McClymonds, V. F. Tapke.
Boone -----	3305	87	1930(C)	T. R. Stanton	Victoria × Richland	1940	Iowa	T. R. Stanton, H. C. Murphy, F. A. Coffman, L. C. Burnett, H. B. Humphrey.
Hancock ----	3346	88	1928(C)	F. A. Coffman	Markton × Rainbow	1940	Iowa	F. A. Coffman, H. C. Mur- phy, T. R. Stanton, L. C. Burnett, H. B. Humphrey.
Marion -----	3247	89	1928(C)	F. A. Coffman	Markton × Rainbow	1940	Iowa	F. A. Coffman, H. C. Mur- phy, T. R. Stanton, L. C. Burnett, H. B. Humphrey.
Vicland -----	3611	93	1930(C)	T. R. Stanton	Victoria × Richland	1941	Wis.	H. L. Shands, B. D. Leith, T. R. Stanton, H. C. Murphy, F. A. Coffman, H. Stevens, H. B. Humphrey, L. C. Burnett.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year received, last cross made or selected ²	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Huron	3756	96	1923(C)	G. A. Wiebe	Markton × Victory	1940	Mich.	E. E. Down, J. W. Thayer, T. R. Stanton, F. A. Coffman, G. A. Wiebe, L. L. Davis, A. E. McClymonds, V. F. Tapke.
Uton	3141	97	1923(C)	G. A. Wiebe	Markton × Swedish Select.	1937	Utah	D. C. Tingey, R. W. Woodward, G. A. Wiebe, T. R. Stanton, F. A. Coffman, A. G. Goth.
Otoe	2886	98	1920(S)	Arthur Anderson, T. A. Kieselbach.	Burt -----	1931	Nebr.	Arthur Anderson, T. A. Kieselbach, K. S. Quisenberry.
Tama	3502	99	1930(C)	T. R. Stanton	Victoria × Richland	1942	Iowa	H. C. Murphy, L. C. Burnett, T. R. Stanton, F. A. Coffman.
Marida ¹	2571	100	1923(C)	G. A. Wiebe	Markton × Idamine	1940	Idaho	C. A. Michels, K. H. Klages, T. R. Stanton, F. A. Coffman, G. A. Wiebe, L. L. Davis, A. E. McClymonds, V. F. Tapke.

Bridger -----	2611	102	1923(C)	G. A. Wiebe	Markton × Victory	1941	Mont.	T. R. Stanton, F. A. Coffman, R. P. Murphy, H. Stevens, G. A. Wiebe.
Cedar -----	3314	103	1930(C)	T. R. Stanton	Victoria × Richland	1944	Nebr.	H. C. Murphy, K. S. Quisen- berry, T. R. Stanton, F. A. Coffman, L. C. Burnett, H. B. Humphrey.
Mission -----	2588	104	1923(C)	G. A. Wiebe	Markton × Victory	1945	Mont.	S. C. Litzenberger, R. P. Murphy, T. R. Stanton, F. A. Coffman, H. Stevens, G. A. Wiebe.
Clinton ³ -----	3971	105	1932(C)	H. C. Murphy	Richland × Green Russian 2× Bond.	1946	Iowa, Ind., Ill.	H. C. Murphy, L. C. Burnett, R. M. Caldwell, T. R. Stan- ton, F. A. Coffman, A. T. Bartel, H. Stevens, J. L. Ro- binson.
Benton -----	3910	106	1932(C)	H. C. Murphy	Richland × Green Russian 2× Bond.	1946	Iowa, Ind.	H. C. Murphy, L. C. Burnett, R. M. Caldwell, T. R. Stan- ton, F. A. Coffman.
Mindo -----	4328	107	1931(C)	H. K. Hayes and others.	Bond 3× Minota × White Russian 2× Black Mesdag.	1946	Minn.	H. K. Hayes, M. B. Moore, • and associates.
Bonda -----	4329	108	1931(C)	H. K. Hayes and others.	Bond × Anthony --	1946	Minn.	H. K. Hayes, M. B. Moore, and associates.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Eaton -----	3908	109	1932(C)	H. C. Murphy	Iogold × Bond	----	1946 Mich.	H. C. Murphy, E. E. Down, L. C. Burnett, T. R. Stanton, F. A. Coffman, J. W. Thayer.
Osage -----	3991	111	1935(C)	F. A. Coffman	Fulton 2× Victoria × Richland.		1945 Kans.	F. A. Coffman, H. Stevens, E. G. Heyne, C. O. Johnston, H. B. Humphrey, H. C. Mur- phy.
Neosho -----	4141	112	1935(C)	F. A. Coffman, H. Stevens.	Fulghum × Markton 2× Victoria × Rich- land.		1945 Kans.	E. G. Heyne, C. O. Johnston, F. A. Coffman, H. Stevens, H. C. Murphy, T. R. Stanton.
Andrew -----	4170	113	1933(C)	M. B. Moore, H. K. Hayes.	Bond × Rainbow	--	1949 Minn.	H. K. Hayes, M. B. Moore.
Cherokee -----	3846	114	1932(C)	H. C. Murphy	Richland × Green Russian 2× Bond.		1948 Kans. 1949 Nebr.	H. C. Murphy, L. C. Burnett, T. R. Stanton, F. A. Coffman, E. G. Heyne, L. P. Reitz.

Nemaha -----	4301	115	1936(C)	H. C. Murphy	Victoria × Richland 2× Morota × Bond.	1948	Nebr., Kans.	H. C. Murphy, L. C. Burnett, L. P. Reitz, K. S. Quisen- berry, T. R. Stanton, F. A. Coffman, H. Stevens.
Cody ⁴ -----	3916	116	1934(C)	F. A. Coffman	Victoria × Richland 2× Bannock.	1949	Idaho	F. A. Coffman, H. Stevens, H. B. Humphrey, H. C. Mur- phy, T. R. Stanton, C. S. Hol- ton.
Overland ----	4181	117	1934(C)	F. A. Coffman	Victoria × Richland 2× Bannock.	1947	Idaho	F. A. Coffman, H. Stevens, H. B. Humphrey, H. C. Mur- phy, T. R. Stanton, C. S. Hol- ton.
Shelby -----	4372	118	1932(C)	H. C. Murphy	Anthony × Bond	1950	Iowa	H. C. Murphy, L. C. Burnett, T. R. Stanton, F. A. Coffman.
Zephyr -----	4800	119	1931(C)	H. K. Hayes and others.	Bond × Anthony	1949	Minn.	H. K. Hayes, M. B. Moore and associates.
Mo. 0-200 ----	4626	125	1936(C)	B. M. King	Columbia 2× Bond × Iogold.	1949	Mo.	J. M. Poehlman, C. H. King- solver, B. M. King.
Mo. 0-205 ----	4988	126	1936(C)	B. M. King	Columbia 2× Victo- ria × Richland.	1951	Mo.	J. M. Poehlman, C. H. King- solver, B. M. King.
Mohawk -----	4327	127	1932(C)	H. C. Murphy	Bond 2× Richland × Green Russian.	1947	N.Y.	H. C. Murphy, H. H. Love, L. C. Burnett, N. F. Jensen, T. R. Stanton, F. A. Coffman, G. C. Kent, H. Stevens.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.L. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Craig -----	5332	128	1939(C)	H. H. Love	Ithacan × Victoria.	1951	N.Y.	N. F. Jensen, H. H. Love, G. C. Kent, A. A. Johnson.
Burnett -----	6537	140	1941(C)	H. C. Murphy	Victoria 2× Hajira × Banner 3× Colo.	1957	Iowa	H. C. Murphy, L. C. Burnett, K. J. Frey, R. E. Atkins.
Centore -----	3865	141	1934(C)	F. A. Coffman	Victoria × Richland 2× Bannock.	1956	Oreg.	F. A. Coffman, H. Stevens, H. B. Humphrey, H. C. Mur- phy, T. R. Stanton, C. S. Hol- ton, W. H. Foote.
Minhafer ----	6913	143	1947(C)	H. K. Hayes and others.	Bond × Rainbow 2× Hajira × Joannette 3× Landhafer.	1957	Minn.	W. M. Myers, F. K. S. Koo, H. K. Hayes, M. B. Moore, B. J. Roberts.
Minland -----	6765	144	1946(C)	H. K. Hayes and others.	Landhafer 3× Mindo 2× Hajira × Jo- annette.	1955	Minn.	W. M. Myers, F. K. S. Koo, H. K. Hayes, M. B. Moore, B. J. Roberts.
Ransom -----	5927	145	1945(C)	H. C. Murphy	Sac 2× Hajira × Jo- annette.	1956	N.Dak.	H. C. Murphy, S. C. Litzen- berger, L. C. Burnette, T. E. Stoa.

Winema -----	4373	146	1930(C)	T. R. Stanton	Magistral × Rich- land	1954	Oreg.	W. H. Foote, H. C. Murphy, T. R. Stanton, A. E. Gross, H. Stevens, H. B. Humphrey.
Bentland ----	6930	147	1947(C)	R. M. Caldwell and others.	Benton ^s × Land- hafer.	1956	Ind.	R. M. Caldwell, L. E. Comp- ton, F. L. Patterson, J. F. Schafer.
Clintland ---	6701	148	1947(C)	R. M. Caldwell and others.	Clinton 59 ⁴ × Land- hafer.	1954	Ind.	R. M. Caldwell, L. E. Comp- ton, F. L. Patterson, J. F. Schafer.
Newton -----	6642	151	1943(C)	R. M. Caldwell and others.	Nemaha 3 × Clinton 2 × Boone × Cartier.	1956	Ind.	R. M. Caldwell, L. E. Comp- ton, F. L. Patterson, J. F. Schafer.
Putnam -----	6927	152	1942(C)	R. M. Caldwell and others.	Boone × Cartier 2 × Clinton.	1957	Ind.	R. M. Caldwell, L. E. Comp- ton, J. F. Schafer, F. L. Pat- terson.
Dupree -----	4672	154	1940(C)	C. W. Cochran, E. G. Heyne.	Anthony × Bond 2 × Richland × Fulghum.	1954	S.Dak.	J. E. Grafius, V. A. Dirks, G. W. Cochran, C. O. Johnston, E. G. Heyne, E. D. Hansing.
Waubay -----	5440	156	1943(C)	F. A. Coffman	Clinton × Marion --	1954	S.Dak.	F. A. Coffman, J. E. Grafius, V. A. Dirks, D. D. Harpstead, H. C. Murphy, H. A. Roden- hiser, H. Stevens, T. R. Stan- ton, L. C. Burnett, C. S. Hol- ton.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year received, last cross made or selected ²	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Jackson -----	5441	159	1943(C)	F. A. Coffman	Clinton × Marion	--	1954 Mich.	F. A. Coffman, K. J. Frey, H. C. Murphy, H. A. Rodenhiser, H. Stevens, T. R. Stanton, L. C. Burnett.
Park -----	6611	160	1942(C)	F. A. Coffman, H. Stevens.	Clinton × Overland ²		1953 Mont., 1958 Idaho	F. A. Coffman, H. Stevens, F. C. Petr, R. F. Eslick, H. A. Rodenhiser.
Bonham -----	4676	161	1932(C)	H. C. Murphy	Richland × Green Russian 2 × Bond.		1949 Mich.	H. C. Murphy, E. E. Down, K. J. Frey, H. Stevens, F. A. Coffman, T. R. Stanton, L. C. Burnett.
Ajax -----	4157	162	1930(C)	J. N. Welsh	Victory × Hajira	--	1942 Manitoba	J. N. Welsh.
Clarion -----	5647	163	1943(C)	F. A. Coffman	Clinton × Marion	--	1954 Maine	F. A. Coffman, C. R. Blackmon, H. A. Rodenhiser, H. Stevens, T. R. Stanton, L. C. Burnett.

Garry -----	6662	164	1932(C)	J. N. Welsh	Hajira × Banner 2× Victoria 3× Victory.	1953	Mani- toba	J. N. Welsh.
Rodney -----	6661	166	1943(C)	J. N. Welsh	Hajira × Banner 2× Victoria 3× Hajira 4× Roxton.	1954	Mani- toba	J. N. Welsh.
Simcoe -----	6767	167	1940(C)	D. N. Huntley	Ajax × Erban -----	1953	Ontario	D. N. Huntley.
Macon -----	6625	168	1939(C)	H. C. Murphy	Columbia × Marion	1959	Mo.	J. M. Poehlman, D. T. Sech- ler, C. Hayward, M. White- head, H. C. Murphy.
Nehawka ----	7194	170	1950(S)	L. P. Reitz	Cherokee -----	1959	Nebr.	J. W. Schmidt, L. P. Reitz, K. Kaukis.
Tonka -----	7192	172	1946(S)	A. M. Schle- huber	Clinton -----	1959	Okla.	A. M. Schlehuber, B. C. Cur- tis, R. M. Oswalt.
Oneida -----	7458	176	1944(C)	H. H. Love, W. T. Craig.	Goldwin 2× Victoria × Rainbow.	1960	N.Y.	N. F. Jensen, H. H. Love, W. T. Craig.
Nodaway ----	7272	179	1950(C)	J. M. Poehl- man	Columbia × Marion 4× Victoria 2× Ha- jira × Banner 3× Victory × Hajira 2× Roxton.	1958	Mo.	J. M. Poehlman.
Colfax -----	7595	181	1951(C)	McCurdy Co.	Columbia × Clinton 2× Landhafer 3× Santa Fe × Mo. 0- 200.	1955	Iowa	W. O. McCurdy and Sons Seed Co., LeRoy McCurdy, Carl Koehler.

See footnotes at end of table.

TABLE 6.—*History of improved spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Goldcrest ----	7596	182	1950(C)	McCurdy Co.	Columbia × Clinton 2 × Santa Fe 3 × Go- pher.	1954	Iowa	W. O. McCurdy and Sons Seed Co., LeRoy McCurdy, Carl Koehler.
Goldfield ----	7597	183	1951(C)	McCurdy Co.	Clinton × Santa Fe 2 × Mo. 0-200 3 × Ajax.	1954	Iowa	W. O. McCurdy and Sons Seed Co., LeRoy McCurdy, Carl Koehler.
Jewell -----	7598	184	1950(C)	McCurdy Co.	Clinton × Santa Fe 2 × Mo. 0-200 3 × Ajax.	1954	Iowa	W. O. McCurdy and Sons Seed Co., LeRoy McCurdy, Carl Koehler.
Mahaska ----	7599	185	1951(C)	McCurdy Co.	Clinton × Santa Fe 2 × Mo. 0-200 3 × Ne- maha.	1955	Iowa	W. O. McCurdy and Sons Seed Co., LeRoy McCurdy, Carl Koehler.
Ortley -----	7473	186	1958(S)	D. D. Harp- stead	Garry 5 × Santa Fe 4 × Victoria 2 × Ha- jira × Banner 3 × Ajax.	1963	S.Dak.	D. D. Harpstead, R. S. Al- brechtsen.
Beedee -----	6752	187	1947(C)	H. L. Shands	Beacon 2 × Hawkeye × Victoria.	1956	Wis.	H. L. Shands, Z. M. Ara- winko, S. Lund.

Branch -----	5013	188	1939(C)	H. L. Shands	Forward ² 2× Victoria × Richland.	1951	Wis.	H. L. Shands, D. C. Army.
Fayette -----	6916	189	1949(C)	H. L. Shands	Vicland 3× Branch 2× Clinton ² × Santa Fe.	1956	Wis.	H. L. Shands, C. M. Brown.
Forvic -----	4164	190	1935(C)	H. L. Shands	Forward 2× Victoria × Richland.	1946	Wis.	H. L. Shands, D. C. Army, C. W. Schaller.
Sauk -----	5946	191	1942(C)	H. L. Shands	Forward 2× Victoria × Richland 3× Andrew.	1954	Wis.	H. L. Shands, D. C. Army, A. R. Brown.
Neal -----	7440	192	1952(C)	J. W. Schmidt	Nemaha 2× Andrew × Landhafer.	1963 1963 1963	Nebr. S.Dak. Iowa.	J. W. Schmidt, D. P. McGill, D. D. Warnes.
Santee -----	7454	193	1947(C)	J. W. Schmidt	Clinton 4× Victoria 2× Hajira × Banner 3× Victory.	1965	Nebr.	J. W. Schmidt, D. P. McGill, D. D. Warnes.
Niagara -----	7528	194	1952(C)	N. F. Jensen	Garry Sel. 5 4× Goldwin 2× Victoria × Rainbow 3× Branch.	1964	N.Y.	N. F. Jensen.
Brave -----	7690	196	1955(C)	C. M. Brown	Putnam 5× Landhafer 3× Mindo 2× Hajira × Joannette 4× Andrew.	1965	Ill.	C. M. Brown, H. Jedlinski.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Tioga -----	7524	197	1952(C)	N. F. Jensen	Garry Sel. 52 × Gold- win × Clinton.	1965	N.Y.	N. F. Jensen.
Goodfield ----	7266	198	1952(C)	H. L. Shands	Hawkeye × Victoria 2 × Garry 3 × Clint- land.	1959	Wis.	H. L. Shands, P. E. Pawlisch, Z. M. Arawinko.
Portage -----	7107	199	1947(C)	H. L. Shands	Hawkeye × Victoria 2 × Ajax.	1960	Wis.	H. L. Shands, Z. M. Ara- winko, R. A. Forsberg.
Dodge -----	7269	200	1947(C)	H. L. Shands	Hawkeye × Victoria 2 × Garry 3 × Clint- land.	1961	Wis.	H. L. Shands, L. G. Cruger, R. A. Forsberg.
Garland -----	7453	201	1947(C)	H. L. Shands	Hawkeye × Victoria 2 × Garry 3 × Clint- land.	1962	Wis.	H. L. Shands, R. A. Fors- berg, Z. M. Arawinko.
Lodi -----	7561	202	1953(C)	H. L. Shands	Richland × Bond 3 × Garry 2 × Hawk- eye × Victoria.	1963	Wis.	H. L. Shands, R. A. Fors- berg.
Orbit -----	7811	203	1952(C)	N. F. Jensen	Alamo 4 × Garry Sel. 53 × Goldwin 2 × Victoria × Rainbow.	1966	N.Y.	N. F. Jensen.

Bingham	7588	210	1956(C)	F. A. Coffman	Cleo × Improved Garry 5× Bonda 2× Joannette 3× Santa Fe 4× Mo. 0-205.	1966	Idaho	F. A. Coffman, F. C. Petr, Harland Stevens.
Bonkee	7563	211	1957(C)	Iowa State Univ.	Bonham ⁵ 6× Cherokee ³ 5× Victoria 2× Hajira × Banner 3× Victory × Hajira 4× Roxton.	1963	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
AuSable	7670	214	1956(C)	J. E. Grafius	Beaver × Garry 2× Clinton 3× Clintland 4× Minor.	1963	Mich.	J. E. Grafius, R. L. Kiesling.
Coachman	7684	215	1956(C)	J. E. Grafius	Marne ² 4× Beaver × Garry 2× Clinton 3× Clintland.	1963	Mich.	J. E. Grafius, Dimon Wolfe, R. L. Kiesling.
Dawn	8029	216	1959(C)	D. C. Ebeltoft	Ajax × Ransom 5× Roxton 3× Victoria 2× Hajira × Banner 4× Ajax 3× Victoria 2× Hajira × Banner.	1966	N.Dak.	D. C. Ebeltoft, H. Roald Lund.
Wyndmere	7552	217	1955(C)	D. C. Ebeltoft	Ajax × Ransom ----	1966	N.Dak.	D. C. Ebeltoft, H. Roald Lund.
Jaycee	7971	218	1956(C)	C. M. Brown	Clintland 3× Garry 2× Hawkeye × Victoria 4× Putnam.	1967	Ill.	C. M. Brown, H. Jedlinski.

See footnotes at end of table.

TABLE 6.—*History of improved registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
O'Brien	8174	220	1953(C)	Iowa State Univ.	Clinton 5× Victoria 2× Hajira × Banner 3× Victory × Hajira 4× Rox- ton.	1967	Iowa	J. Artie Browning, K. J. Frey, R. L. Grindeland, M. D. Simons, L. J. Michel.
Cayuse	8263	221	1952(C)	N. F. Jensen	Craig × Alamo	1966	Wash., Idaho.	N. F. Jensen, C. F. Konzak, G. W. Breuhl, H. M. Austen- son, P. C. Crandall, K. J. Morrisson.
Holden	7978	224	1952(C)	H. L. Shands	Clinton 3× Garry 2× Hawkeye × Vic- toria.	1968	Wis.	R. A. Forsberg, H. L. Shands, Z. M. Arawinko.
Kota	8178	227	-----	-----	Clinton ⁶ × Land- hafer 5× Victoria 2× Hajira × Banner 3× Victory × Hajira 4× Roxton 6× Garry.	1969	S.Dak.	R. S. Albrechtsen, D. D. Harpstead.
Pettis	7805	229	1954(C)	J. M. Poehl- man	Victoria 2× Hajira × Banner 3× Vic- tory 2× Hajira × Ajax 4× Mo. 0-205.	1968	Mo.	J. M. Poehlman.

Victory	-----	560	232	1892(S)	Hjalmer Nilsson	Milton	-----	1908	North- ern U.S.	Hjalmar Nilsson, M. A. Carleton.
Otter	-----	8304	237	1954	F. J. Koo	Landhafer 3 × Mindo 2 × Hajira × Jo- anette 4 × Andrew ² 5 × Rodney.		1970	Minn.	D. D. Stuthman, O. D. Smith, R. A. Kleese, M. B. Moore.
Nodaway	70 --	8442	239	1950(S)	J. M. Poehlman	Nodaway	-----	1970	Mo.	J. M. Poehlman, D. T. Sechler.
Multiline E68		8345	242	1954(C)	K. J. Frey	Clintland × Garry-5 (recurrent parent).		1968	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
Multiline E69	-----		243	1954(C)	K. J. Frey	Clintland × Garry-5 (recurrent parent).		1969	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
Multiline E70	-----		244	1954(C)	K. J. Frey	Clintland × Garry-5 (recurrent parent).		1970	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
Multiline M68		8346	245	1957(C)	K. J. Frey	Clintland ^s × Victo- ria 2 × Hajira × Banner 3 × Victory × Hajira 4 × Roxton is the recurrent par- ent.		1968	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.

See footnotes at end of table.

TABLE 6.—*History of improved spring-sown oat varieties in the United States—Continued*

Variety	C.I. No. ¹	Reg. No.	Year re- ceived, last cross made or selected ²	Selected, crossed, or in- troduced	Source variety or parent of cross	Year re- leased	Where released	Source or name of breeder
Multiline M69	-----	246	1957(C)	K. J. Frey	Clinton ⁴ × Victoria 2 × Hajira 1969 × Banner 3 × Victory × Hajira 4 × Roxton is the recurrent parent.	1969	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
Multiline M70	-----	247	1957(C)	K. J. Frey	Clinton ⁴ × Victoria 2 × Hajira × Banner 3 × Victory × Hajira 4 × Roxton is the recurrent parent.	1970	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
Grundys	-----	8445	249	1954(C)	K. J. Frey	1971	Iowa	K. J. Frey, J. A. Browning, R. L. Grindeland.
Trio	-----	7698	252	1956	F. A. Coffman	1971	Kans. Nebr.	F. A. Coffman J. W. Schmidt E. G. Heyne
					Improved Garry 5 × Landhafer 3 × Mindo 2 × Hajira × Jo-anette 4 × Andrew.			

¹ C.I. numbers listed are those most commonly used. Several varieties have additional C.I. numbers.² R=received; C=crossed; S=selected.³ The first oat named Clinton in the United States was C.I. 1894, a selection from Silvermine, C.I. 1013.⁴ Cody II C.I. 8276, reselection of C.I. 3916.

TABLE 7.—*History of not registered spring-sown oat varieties in the United States*

Variety	C.I. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeders
Abda	----- 7145	1950(C)	F. K. S. Koo	Landhafer 3 × Mindo 2 × Hajira × Joannette 4 × Andrew.	1953	Minn.	Minnesota.
Abegweit	---- 4970	1937(C)	-----	Vanguard × Erban	1947	Ontario	Ottawa, Canada.
Ada	----- 7144	1950(C)	F. K. S. Koo	Landhafer 3 × Mindo 2 × Hajira × Joannette 4 × Andrew.	1953	Minn.	Minnesota.
Advance	---- 3845	1932(C)	H. C. Murphy	Richland × Green Russian 2 × Bond.	1949	N.Y.	H. C. Murphy, H. H. Love, L. C. Burnett, N. F. Jensen, T. R. Stanton, F. A. Coffman, G. C. Kent, H. Stevens.
Alaska	----- 1710	1900(R)	-----	Tobolsk	1904	Wis.	R. A. Derick, L. H. Newman.
Archangel	---- 1947	1920(R)	S. M. Dietz	Source unknown	-----	Iowa	S. M. Dietz.

See footnotes at end of table.

TABLE 7.—*History of not registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeders
Basin	5346	1945(C)	F. A. Coffman	Clinton × Overland ²	1961	Mont.	R. F. Eslick, Verne Stewart, H. R. Gruenther, F. A. Coffman, H. Stevens.
Beacon	4608	1936(C)		Gold Rain × Alaska 2× Legacy × Victoria 3× Victory × Black Mesdag 2× Vanguard.	1947	Ontario	Ottawa, Canada.
Beaver	4521	1937(C)		Vanguard × Erban	1945	Canada	Ottawa, Canada.
Bondvic	5401		H. C. Murphy	Anthony × Bond 2× Boone.		Iowa	H. C. Murphy.
Camas	2965	1923(C)	G. A. Wiebe	Markton × Victory	1935	Idaho, Wash.	G. A. Wiebe, C. S. Holton, T. R. Stanton, F. A. Coffman.
Canuck	4024	1926(C)		Hajira × Jostrain	1949	Canada	Winnipeg, Canada.
Cartier	2565	1913(C)		Alaska × Early Triumph.	1932	Canada	J. N. Welsh, R. B. Carson, W. J. Cherwick, W. A. F. Hagborg, B. Paterson, H. A. H. Wallace.

Clintafe -----	5869	1947(C)	H. C. Murphy	Clinton ⁴ × Santa Fe	1952	Iowa	H. C. Murphy, R. E. Atkins, D. D. Morey, H. Stevens.
Clintford ----	7463	1952(C)	R. M. Caldwell and others.	Clinton 59 ⁷ × Landhafer 2 × Milford.	1966	Ind.	R. M. Caldwell, L. E. Compton, J. F. Schafer, F. L. Patterson.
Clintland 60 --	7234	1954(C)	R. M. Caldwell and others.	Clintland 3 × Clinton × Boone 2 × Cartier 4 × Victoria 2 × Hajira × Banner 3 × Victory × Hajira 2 × Roxton.	1959	Ind.	R. M. Caldwell, L. E. Compton, F. L. Patterson, J. F. Schafer.
Clintland 64 --	7639	1960(C)	R. M. Caldwell and others.	Clintland ⁵ 5 × Landhafer 3 × Mindo 2 × Hajira × Joannette 4 × Andrew 6 × Clintland 2 × Clintland ⁶ × Grey Algerian.	1964	Ind.	J. F. Schafer, F. L. Patterson, L. E. Compton, R. M. Caldwell.
Clinton "11" --	4606	1945(S)	O. T. Bonnett	Clinton -----	-----	Ill.	O. T. Bonnett.
Clinton 59 ----	4259	1943(S)	R. M. Caldwell and others.	Clinton -----	1959	Ind.	R. M. Caldwell, L. E. Compton, H. C. Murphy.
Cody II (Aero Cody H. Y. R.),	8276	-----	R. Pfeifer.	Mass Reselection from Cody C.I. 3916.	-----	Wyo.	R. Pfeifer

See footnotes at end of table.

TABLE 7.—*History of not registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source, variety, or parent of cross	Year released	Where released	Source or name of breeders
Cole	834	1905(S)	John S. Cole	Sixty-Day	1907	S.Dak.	J. S. Cole.
Colo	3972	1936(C)	H. C. Murphy	Hancock 2× Morota × Bond.	1946	Iowa	H. C. Murphy, L. C. Burnett, T. R. Stanton, F. A. Coffman.
Control	3603	1930(C)	T. R. Stanton	Victoria × Richalnd	1941	Iowa	T. R. Stanton, H. C. Murphy, F. A. Coffman, L. C. Burnett, H. B. Humphrey, C. S. Reddy.
Dasix	4161	1925(S)		Sixty-Day	1942	Canada	Guelph, Canada.
Diana	7921	1959(C)	R. M. Caldwell and others.	Roxton 3× Victoria 2× Hajira × Banner 4× Ajax 3× Victoria 2× Hajira × Banner 5× Clinton × Bond 2× PI 174544-3 6× Clintland 3× Clinton ² × Ark. 674 2× Milford.	1966 1971	Brazil Ind.	R. M. Caldwell, F. L. Paterson, J. F. Schafer, L. E. Compton.
Eagle ² × (2 Hajira × Joanette: C.I. 4023).	8111	1964		Eagle ² (2 Hajira × Joanette) Parent and Rust Tester Differential.	-----	Winnipeg, Ontario.	Winnipeg, Ontario, Canada.

Early Joannette	1092	1920(S)	T. R. Stanton	Probably natural hybrid between Joannette and some early variety such as Burt.	-----	-----	-----
Early Red Rustproof.	2823	1918(S)	J. H. Parker	-----	-----	-----	J. H. Parker.
Edkin	2330	1921(S)	F. A. Coffman	Kherson	-----	-----	F. A. Coffman.
Fortune	5226	1939(C)	J. B. Harrington	Victory 3 × Victoria × Richland 2 × Bannock.	1948	Canada	Saskatchewan, Canada.
Fundy	7288	1946(C)	-----	Ajax × Abegweit	1957	Canada	New Brunswick, Canada.
Glen	7652	1940(C)	-----	Ajax × Roxton	1957	Canada	Quebec, Canada.
Hajira × Banner.	7438	1926	-----	Hajira × Banner R. L. 524 Parent and Rust Tester Differential.	-----	Winnipeg, Ontario.	Laboratory of Cereal Breeding, Winnipeg, Manitoba, Canada.
Hajira × Joannette.	4023	1926	-----	Hajira × Joannette R. L. 811 Parent and Rust Tester Differential.	-----	Winnipeg, Ontario.	Laboratory of Cereal Breeding, Winnipeg, Manitoba, Canada.
Hawkeye	2464	1919	S. M. Dietz	Richland × Green Russian.	1918	Iowa	S. M. Dietz, USDA and Iowa Agr. Expt. Sta., Ames, Iowa.
Hay	1622	1912(R)	-----	Burt	-----	-----	Kansas.

See footnotes at end of table.

TABLE 7.—*History of not registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source, variety, or parent of cross	Year released	Where released	Source or name of breeders
Hudson	1906		W. C. Etheridge	Sixty-Day			W. C. Etheridge.
Iowa D67	2870	1918(C)	S. M. Dietz	Richland × Green Russian.		Iowa	S. M. Dietz.
Iowa D69	2463	1918(C)	S. M. Dietz	Richland × Green Russian.		Iowa	S. M. Dietz.
Johnson	5105	1948(R)	E. Shulkcum	Unknown			Floyd County, Va.
Jostrain	2660	1919	W. L. Gordon	Selected from variety Joannette.	1919	Canada	Dominion Lab. Plant Path., Winnipeg, Manitoba, Canada.
Kent	3909	1932(C)	H. C. Murphy	Richland × Green Russian 2 × Bond.	1949	Mich.	H. C. Murphy, E. E. Down, L. C. Burnett, T. R. Stanton, F. A. Coffman, J. W. Thayer.
Lanark	4981	1938(C)		Onward 2 × Anthony × Bond.	1951	Canada	Ottawa, Canada.
Larain	6541	1927(C)		Alaska × Gold Rain	1945	Canada	Ottawa, Canada.

LaSalle	5628	1941(C)	O. T. Bonnett	Marion × Clinton	-----	Ill.	O. T. Bonnett.
Logan	6929	1947(C)	-----	Benton × Marion	-----	Ill.	C. M. Brown, R. M. Endo, J. W. Pendleton.
Magnif 28	7654	1940(C)	Pedro Marco	Santa Fe No. 1 × Klein Mar.	-----	-----	Jose Vallega.
Magnif 29	7655	1942(C)	J. Vallega	Santa Fe No. 1 × Tama	-----	-----	Jose Vallega.
Milford	7320	1931(C)	E. T. Jones	Victory 3 × Kyko × Grey Winter 2 × Bounti- ful × Grey Winter.	1947	Wales	Aberystwyth, Wales.
Minrus	2144	1918	H. K. Hayes, R. J. Garber.	Minota × White Rus- sian (White Tartar).	1931	Minn.	H. K. Hayes, and R. J. Garber, Minn. Agr. Expt. Sta., St. Paul, Minn.
Minton ²	6935	-----	-----	Landhafer 3 × Mindo 2 × Hajira × Joannette 4 × Clinton.	1959	Minn.	Minnesota.
Miomark	3418	-----	M. Fowlds	Iogold × Markton ²	1941	S.Dak.	M. Fowlds, S. P. Swenson.
Nebraska 21	1371	1909(S)	E. G. Montgomery	Kherson	1917	Nebr.	E. G. Montgomery, T. A. Kieselbach.
O.A.C. 72	846	1903(S)	C. A. Zavitz	Siberian	1911	Canada	Guelph, Canada.

See footnotes at end of table.

TABLE 7.—*History of not registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source, variety, or parent of cross	Year re-leased	Where re-leased	Source or name of breeders
O.A.C. 144	2476	1923(S)	C. R. Klinck	O.A.C. 72	1923	Canada	C. R. Klinck, C. A. Zavitz, W. J. Squirrel, A. W. Mason.
Opala	7399			Bond × Rainbow 2 × Hajira × Joannette 3 × Landhafer 4 × Andrew.	Early 1960's.	Mexico	Minnesota.
Palomino	5636	1946(C)	F. A. Coffman	Andrew × Clinton	1955	N.Dak.	F. A. Coffman, T. J. Conlon, R. J. Douglas, H. B. Humphrey.
Pendek	7801	1962(R)		Flamingsgold × Binder			Rotterdam, Holland.
Pennfield	7571	1956(C)	F. A. Coffman	Cleo × Improved Garry 5 × Bonda 2 × Hajira × Joannette 3 × Santa Fe 4 × Mo. 0-205.	1965	Pa.	R. P. Pfeifer, F. A. Coffman, F. C. Petr, H. Stevens.
Putnam 61	7531	1956(C)	R. M. Caldwell and others.	Putnam ⁴ 5 × Landhafer 3 × Mindo 2 × Hajira × Joannette 4 × Andrew.	1961	Ind.	J. F. Schafer, F. L. Patterson, L. E. Compton, R. M. Caldwell.

Richland 52	--	3002	1928(S)	F. A. Coffman	Richland	-----	1937	Iowa	F. A. Coffman, L. C. Burnett.
Roxton	-----	4134	1927(C)	E. M. Lods	Siberian × Joannette 2 × O.A.C. 72 × Early Ripe.		1943	Canada	Quebec, Canada.
Russell	-----	7557	1951(C)	-----	Garry × Ukraine 2 × Abegweit ² .		1960	Canada	Ottawa, Canada.
Sac	-----	3907	1932(C)	H. C. Murphy	Richland × Green Russian 2 × Bond.		1946	Maine	H. C. Murphy, L. C. Burnett, T. R. Stanton, F. A. Coffman.
Scotian	-----	7203	1937(C)	-----	Vanguard × Erban	--	1954	Canada	Nappan, Nova Scotia.
Shasta	-----	3976	1923(C)	G. A. Wiebe	Markton × Victory	----	-----	Oreg.	T. R. Stanton, F. A. Coffman, H. Stevens, G. A. Wiebe, D. E. Hill.
Shefford	----	6941	1939(C)	E. A. Lods	Roxton × Mabel	-----	1954	Canada	Quebec, Canada.
Shield	-----	7209	1944(C)	-----	Roxton 3 × Victoria 2 × Hajira × Banner 4 × Ajax 3 × Victoria 2 × Hajira × Banner.		1957	Canada	Ottawa, Canada.
South Dakota 334.		2884	-----	M. Fowlds	Swedish Select × Kilby 2 × Richland ² 3 × Markton.		-----	S.Dak.	M. Fowlds.

See footnotes at end of table.

TABLE 7.—*History of not registered spring-sown oat varieties in the United States—Continued*

Variety	C.I. No.	Year received, last cross made or selected ¹	Selected, crossed, or introduced	Source, variety, or parent of cross	Year released	Where released	Source or name of breeders
Tabor	1777	1917(R)	G. M. Reed	Unknown	-----	-----	Tabor, Bohemia.
Tippecanoe	7680	1954(C)	R. M. Caldwell and others.	Clintonland 60 ² × Mo. 0-205.	1965	Ind.	R. M. Caldwell, L. E. Compton, F. L. Patterson, J. F. Schafer.
Trojan	2491	1921(S)	F. A. Coffman	Burt	-----	Colo.	F. A. Coffman.
Tyler	7679	1954(C)	R. M. Caldwell and others.	Clintonland 60 ² × Mo. 0-205.	1966	Ind.	R. M. Caldwell, L. E. Compton, F. L. Patterson, J. F. Schafer.
Vanguard	3837	1926(C)	-----	Hajira × Banner	1936	Canada	Winnipeg, Canada.
Vikota	3602	1930(C)	T. R. Stanton	Victoria × Richland	1943	S.Dak.	H. C. Murphy, J. E. Grafius, L. C. Burnett, T. R. Stanton, F. A. Coffman.
White Bonanza.	1686	1919(R)	-----	Unknown	-----	-----	Unknown.

¹ R=received, C=crossed, and S=selected.² Also Minton, C.I. 2574; see Marida, C.I. 2571, Reg. No. 100 (table 6).

TABLE 8.—*History of registered and not registered spring-sown side oat varieties in the United States*

Variety	C.I. No.	Reg. No.	Year selected, introduced, or named	Selected or introduced	Source or agency that produced or released variety	Source	Parental oat or original geographic source
Black Rival	807		1916	-----	Distributed by Garton's Ltd., Warrington, England.	England	Parentage involved Abundance, Black Tartar, Pioneer, and Potato.
Black Tartar	991	35	1919	A. E. V. Richardson.	Unknown	Australia	Introduced into England from an oriental source about 1750.
Garton Gray	1864	36	1921	W. C. Etheridge	Distributed by Garton's Ltd., Warrington, England.	Missouri	Unknown.
Golden Giant	1606	37	1887	-----	Introduced by W. Atlee Burpee Co., Philadelphia.	Pennsylvania	Vilmorin Seed Co., France.
Green Mountain.	1892	38	1910	-----	Commercial Seed Co., Hamilton, Ontario.	Ontario	Believed to be from Mortgage Lifter × White, Russian.
Magistral	2460 7909	-----	1950's	H. C. Murphy	U.S. Dept. Agr. and Iowa State Univ.	Iowa	Reselected from C.I. 2460, which was originally from Russia.

See footnotes at end of table.

TABLE 8.—*History of registered and not registered spring-sown side oat varieties in the United States*
—Continued

Variety	C.I. No.	Reg. No.	Year selected, introduced, or named	Selected or introduced	Source or agency that produced or released variety	Source	Parental oat or original geographic source
Schumacher No. 7.	2895	-----	1930	W. Schumacher	W. Schumacher, Readlyn, Iowa, received by H. C. Murphy.	Iowa farmer's field.	Unknown.
Sparrowbill	-- 1604	39	1904	M. A. Carleton	Introduced from New Zealand.	New Zealand	Unknown.
Storm King	-- 1602	40	1899	-----	Developed and distributed by Garton's Ltd., Warrington, England.	England	Parentage included Abundance, White Tartar, and Scotch Potato.
Tartar King	-- 1599	41	1899	-----	Developed and distributed by Garton's Ltd., Warrington, England.	England	Parentage included Black Tartar, White Tartar, and White Canadian.
White Tartar ¹ (White Russian).	1614	42	1850	-----	Unknown	-----	Apparently introduced into Russia and then brought to the United States.

¹ Better known in America as White Russian.

TABLE 9.—*History of registered and not registered spring-sown hull-less or naked oat varieties in the United States*

Variety	C.I. No.	Reg. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source, variety, or parent of cross	Year released	Where released	Source or name of breeder
Brighton	----	4160	-----	1932	-----	Markton × Laurel	1941	Canada Central Experimental Farm, Ottawa, Canada.
Chinese Hull-less.	1003	-----	1919	J. H. Reisner	Introduced from Nanking, Kiangsu, China.	-----	-----	China.
Fowlds	-----	1996	-----	1921(C)	Mathew Fowlds	Swedish Select × Kilby ² .	-----	S. Dak. Mathew Fowlds.
James	-----	5015	155	1940(C)	H. C. Murphy	Bond × Double Cross 2 × Nakota.	1950	S. Dak. J. E. Grafius, V. A. Dirks, H. C. Murphy.
Laurel	-----	2231	-----	1903	-----	Banner × Chinese Hull-less.	-----	Canada Central Experimental Farm, Ottawa, Canada.
Liberty	-----	845	-----	1903(C)	-----	Chinese Naked × Swedish Select.	1917	Canada Central Experimental Farm, Ottawa, Canada.

See footnotes at end of table.

TABLE 9.—*History of registered and not registered spring-sown hull-less or naked oat varieties in the United States*—Continued

Variety	C.I. No.	Reg. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder
Nakota	2883		----(C)	Mathew Fowlds	Markton × Richland 2 × Swedish Select × Kilby. ²	1939	S. Dak.	Mathew Fowlds.
Torch	7265		1941(C)	-----	Nakota 2 × Hajira × Joanette.	1951 (about).	Canada	University of Saskatchewan, Saskatchewan, Canada.
Yenmesh ³	1769		1907	E. H. Wilson	Introduced from I-ch'ang, Hupeh Prov., China.	-----	-----	China.

¹ C=cross.² A strain of Chinese Hull-less.³ Apparently a diploid, (7n) chromosomes. All others listed are hexaploids, (21n) chromosomes (Stanton 1955).

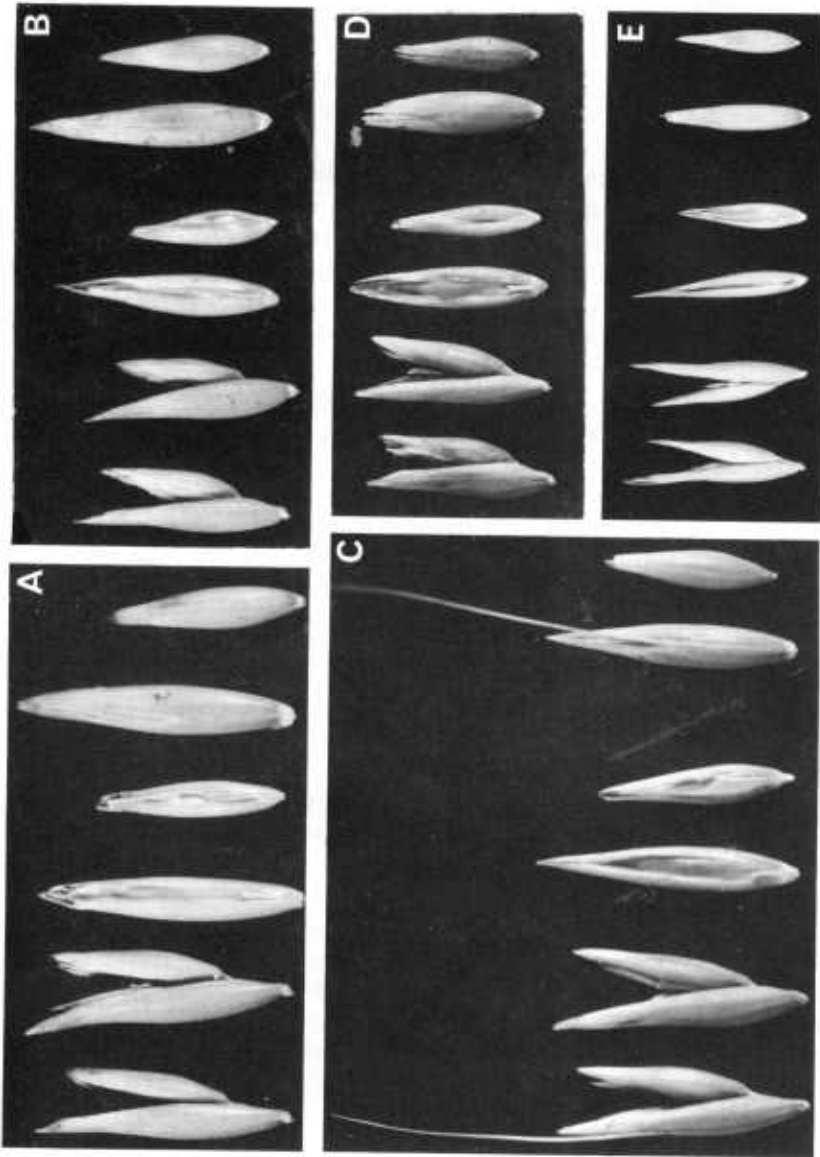


FIGURE 25.—Spikelets and florets of improved varieties of spring-sown oats (spreading panicles): A, Anthony; B, Boone; C, Marion; D, Overland; E, Clinton.

PN-4204 PN-4205 PN-4206 PN-4207 PN-4208

Registered by the American Society of Agronomy**AuSable C.I. 7670****Reg. No. 162****C.A.N. 660**

Description.—Juvenile growth upright; culm stout, hairs on sheath and leaves absent; leaves narrow to medium wide, medium dark green.

Adult plant.—Midseason; midtall (109–137 cm); culms stout, no hairs at nodes; leaf medium narrow, ligule present, no hairs on leaves or sheath; panicle equilateral, midlong (15–22 cm), medium to wide; rachis straight to flexuous, sometimes recurved at tip; nodes 5–7, false node absent; branches (11–30) medium long, raised to straight; spikelets 20–50; glumes white, medium long (20–23 mm) fine to medium in texture; florets usually 2; lemma white, occasionally yellowish white, midlong (16–18 mm); nerves 5–7; palea midwide, white, yellow to gray flecked white; spikelet separation by fracture, basal scar absent to very obscure, nonpubescent; floret separation by fracture, usually distal, occasionally hetero-fracture; awns occasional to numerous straight, subgeniculate to twisted and geniculate; kernel slender to midplump; rachilla segment midlong, slender to midwide, nonpubescent; no hairs on lemma.

Albion C.I. 729**Reg. No. 46**

Description.—Juvenile growth upright; culm medium stout, slightly red, no hairs on sheath or leaf margins; leaf narrow, medium dark green.

Adult plant.—Early; short to midtall (94–104 cm); culms 1–5, slender, no hairs at nodes; leaf midwide, ligule present, medium dark green, no hairs on sheath or leaf margins; panicle equilateral, short to medium long (11–20 cm), medium wide; rachis straight to recurved; nodes 4–6, false node absent; branches (13–20) long, straight to drooping; spikelets 17–23; glumes white, midlong (17–23 mm), fine in texture; florets 2, occasionally 3; lemma white, sometimes grayish white, medium long (16–18 mm); nerves 5–7; palea narrow, white, some gray flecked; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence very occasional; floret separation by fracture, distal; awns occasional straight or subgeniculate; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Andrew C.I. 4170**Reg. No. 113**

Description.—Juvenile growth upright; culm medium stout and often slightly red in color, no hairs on sheath or margins; leaves medium narrow, medium dark green.

Adult plant.—Early; short to midtall (76–112 cm); culms 2–5, medium stout, few to numerous hairs above and below nodes; leaf medium wide, ligule present, medium dark green, hairs on margins absent; panicle equilateral, medium long (14–25 cm), and medium wide; rachis usually straight, occasionally flexuous and recurved at tip; nodes 5–6, false node absent; branches (13–22) medium long, usually straight to raised; spikelets 21–37; glumes white, medium long (18–25 mm), fine to medium in texture; florets 2; lemma yellow, long (16–22 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation by fracture, distal, but occasionally by heterofracture; awns absent; kernel midplump; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Anthony C.I. 2143**Reg. No. 75**

Description.—Juvenile growth upright; culm stout, often slightly red, no hairs on sheath or margins; leaves midwide, color medium dark green, sometimes tinted with red.

Adult plant.—Midseason; midtall (114–123 cm); culms 1–3, medium stout, hairs at node absent to occasional; leaf midwide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, medium long (17–25 cm), medium wide; rachis straight to slightly flexuous; nodes 5–7, false node absent; branches (17–26) midlong, raised; spikelets 21–54; glumes white, medium long (21–25 mm), fine to medium coarse in texture; florets 2; lemma white, midlong (16–18 mm); nerves 5–7; palea midwide, often light gray; spikelet separation by fracture, base usually pointed with occasional short basal hair present; floret separation by fracture, distal; awns occasional, straight; kernel midplump to slender; rachilla segment medium long, medium slender, nonpubescent; no hairs on lemma.

AuSable C.I. 7670**Reg. No. 214**

Description.—Juvenile growth intermediate to upright; culm stout; hairs on sheath and leaf margin absent; leaves intermediate in width, slightly glaucous.

Adult plant.—Midlate, midtall (110–120 cm); culms 2–4, medium to stout, hairs at node absent; leaf midwide, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (17–20 cm), and wide (8–9 cm); rachis straight to flexuous; nodes 6–7, false node absent; branches (11–14) midlong (7–9 cm), usually raised in attitude; spikelets 18–25; glumes yellowish white, midlong (21–22 mm), coarse in texture; florets 2–3; lemma yellow, very short (12–14 mm); nerves 7–9; palea very wide, yellow; spikelet separation by fracture, basal scar obscure, basal pubescence few to numerous, short to long; floret separation by fracture, distal; awns numerous, subgeniculate to twisted and geniculate; kernel very plump; rachilla segment long (2–2.5 mm), very slender, occasional to few short hairs present; no hairs on lemma.

Awnless Probsteyer C.I. 1888**Reg. No. 28**

Description.—Juvenile growth medium upright; culm stout; leaves narrow, no hairs on sheath or leaves, dark green.

Adult plant.—Midseason; midtall (110–135 cm); culms 1–4, stout, none or slight pubescence above and below nodes; leaf midwide, ligule present, no hairs on sheath and leaves; panicle equilateral, midlong (21–25 cm), wide; rachis stout, straight to flexuous; nodes 6–8, false node absent; branches (15–31) long, straight to raised or drooping; spikelets very numerous, 34–90; glumes white, midlong (21–23 mm), fine in texture; florets usually 2; lemma yellowish white, short to midlong (15–17 mm); nerves 5–7, obscure; palea midwide, yellowish; spikelet separation by fracture, basal scar absent or very obscure, basal hairs occasional, short; floret separation by fracture, distal, or occasionally by heterofracture; awns few, straight; kernel medium slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Bannock C.I. 2592**Reg. No. 86**

Description.—Juvenile growth upright; culm stout, few hairs on sheath or leaves, medium dark green.

Adult plant.—Midseason; very tall (140–160 cm); culms 2–4, stout,

few to numerous hairs above and below nodes; leaf medium wide, few hairs on sheath or leaves; ligule present, medium dark green; panicle equilateral, long (20–40 cm), medium widespreading; rachis stout, straight, somewhat flexuous; nodes 5–6, false node absent; branches (20–30) long, stiff, usually straight to raised; spikelets 27–41; glumes white, midlong (19–22 mm), medium fine in texture; florets 2, occasionally 3; lemma white, medium long (16–17 mm); nerves 5–7, obscure; palea wide, white; spikelet separation by fracture, basal scar occasional, obscure, pubescence occasional, few, midlong; floret separation by fracture, usually distal; awns few to many, straight to twisted, geniculate; kernel plump; rachilla segment medium short, wide, nonpubescent; no hairs on lemma.

Beedee C.I. 6752**Reg. No. 187**

Description.—Juvenile growth upright; culm stout, hairs on sheath absent; leaves midwide, medium dark green, no hairs on leaf margins.

Adult plant.—Midearly; midtall (99–112 cm); culms 1–5, stout, no hairs at nodes; leaf midwide, ligule present; medium dark green, no hair on sheath or leaves; panicle equilateral, midlong (14–20 cm) and medium wide; rachis straight to flexuous; nodes 4–7, false node absent; branches (15–24), medium long, attitude straight, raised to drooping; spikelets (17–41); glumes pink to red, midlong (17–21 mm), medium to coarse in texture; florets 2–3; lemma slightly grayish yellow to reddish, short to midlong (13–17 mm); nerves 7; palea wide, grayish yellow to grayish red; spikelet separation by fracture, basal scar absent to obscure, occasional medium long to long basal hairs present; floret separation by fracture, distal, but occasionally by heterofracture; awns absent; kernel very plump; rachilla segment short, medium wide, nonpubescent; no hairs on lemma.

Belyak C.I. 1630**Reg. No. 5**

Description.—Juvenile growth intermediate to upright; culm stout, no hairs on sheath or leaf margins; leaves midwide, medium dark green, glaucous.

Adult plant.—Midseason; midtall (90–130 cm); culms 2–3, stout, but not too stiff, few or no hairs above or below nodes; leaf midwide, distinctly glaucous, ligule present, no hairs on sheath and leaf margins; panicle equilateral, midlong (18–27 cm), midwide; rachis medium stout; nodes 5–6, false node absent; branches (18–

27), medium long, stout, stiff, usually raised in attitude; spikelets 30-71; glumes white, glaucous, midlong to long (19-26 mm), medium coarse in texture; florets 2 or 3; lemma white, yellow at base, midlong (16-17 mm); nerves 5-7, obscure; palea wide, white; spikelet separation by fracture, base broad, usually pointed or with very obscure scar, pubescence occasional, short to medium long; floret separation by fracture, distal; awns occasional, straight to subgeniculate; kernel very plump; rachilla segment medium short and medium wide to wide with occasional short pubescence; no hairs on lemma.

Bentland C.I. 6930

Reg. No. 147

Description.—Juvenile growth upright; culm medium stout; no hairs on sheath or leaves; leaf narrow, medium dark green.

Adult plant.—Midearly; midtall (99-119 cm); culms 1-4, stout, few hairs above, numerous below nodes; leaf midwide, ligule present, no hairs on sheath or leaf; panicle equilateral, medium long (17-22 cm), usually medium wide; rachis straight to flexuous; nodes 4-7, false node absent; branches (15-25) usually long and medium stout, straight to raised; spikelets 17-37; glumes white to reddish white, midlong (17-22 mm), coarse in texture; florets 2-3; lemma yellow, gray flecked, short to midlong (14-17 mm); nerves 5-7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, basal pubescence absent; floret separation by heterofracture; awns few to numerous, straight, subgeniculate to twisted and geniculate; kernel plump; rachilla segment short to medium long, slender to medium wide, nonpubescent; no hairs on lemma.

Benton C.I. 3910

Reg. No. 106

Description.—Juvenile growth upright; culm stout, often slightly red, no hairs on sheath or leaves; leaf medium wide to narrow, medium dark green.

Adult plant.—Midearly; midtall (99-127 cm); culms 2-4, stout, hairs few above to numerous below nodes; leaf midwide, ligule present, medium dark green, usually no hairs on sheath or leaf margins; panicle equilateral, medium long (15-20 cm), medium wide; rachis straight to flexuous; nodes 4-6, false node absent; branches (13-20) medium long, usually straight to raised; spikelets 18-35; glumes pink to reddish white, midlong (19-21 mm), medium coarse in texture; florets 2 or 3; lemma yellow, gray flecked, short

to midlong (12–17 mm); nerves 5–7; palea midwide, yellow to red; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional only, very short to long; floret separation by heterofracture usually; awns numerous, straight to twisted and geniculate; kernel plump; rachilla segment midlong and slender, nonpubescent; no hairs on lemma.

Bingham C.I. 7588

Reg. No. 210

Description.—Juvenile growth upright; culm medium stout, no hairs on culm or sheath; leaves medium wide, medium dark green, erect growing, nonpubescent.

Adult plant.—Midlate; midtall to tall (110–130 cm); culms 2–3, medium stout and very stiff, nonpubescent above and below nodes; leaf medium wide, ligule present, tends to be upright in attitude and somewhat glaucous, sheath and blade nonpubescent; panicle equilateral, midlong (20–22 cm), and medium wide; rachis straight, usually stout, slightly flexuous, often slightly recurved at tip; nodes 5–6, false node absent; branches 17–25, midlong (6–8 cm), stiff, attitude straight to raised; spikelets 30–50; glumes yellowish white, midlong (18–20 mm), medium fine in texture; florets 2 and usually 3; lemma white, medium long (17–18 mm); nerves 5–7; palea midwide, white; spikelet separation by fracture, basal scar absent or rare, obscure, nonpubescent; floret separation by fracture, distal, occasionally by heterofracture; awns absent to occasional, straight; kernel midplump; rachilla segment midlong, midwide, nonpubescent; no hairs on lemma.

Black Diamond C.I. 1878

Reg. No. 6

Description.—Juvenile growth upright; culm medium stout, hairs on sheath absent; leaves narrow, medium dark green, nonpubescent.

Adult plant.—Midseason; midtall to tall (94–145 cm); culms 1–5, medium stout, no pubescence above or below nodes; leaf medium narrow, ligule present, medium dark green, no hairs on sheath or leaf margins; panicle equilateral, long (21–30 cm), medium wide; rachis straight, slender, recurved; nodes 6–7, false node absent; branches (21–33), long and drooping; spikelets 34–77; glumes white, long (21–25 mm), fine in texture; florets 2; lemma black with white tips, midlong (16–18 mm); nerves 7, obscure; palea midwide, black; spikelet separation by fracture, basal scar absent to obscure,

numerous short to long basal hairs; floret separation by fracture, distal; awns occasional, subgeniculate to twisted and geniculate; kernel midplump; rachilla segment medium long and medium slender, numerous very short rachilla hairs present; no hairs on lemma.

Black Mesdag C.I. 1877

Reg. No. 7

Description.—Juvenile growth upright; culm medium stout, hairs on sheath and leaves absent; leaves narrow, medium dark green.

Adult plant.—Medium late; midtall to tall (119–124 cm); culms 1–3, medium stout, hairs on nodes absent to occasional; leaf midwide, ligule present, hairs on sheath and leaf margins absent; panicle equilateral, long (22–25 cm), usually wide to very wide; rachis medium stout, straight to often recurved; nodes 6–8, false node absent; branches (18–27), slender, long, drooping; spikelets 24–44; glumes white, midlong (22–25 mm), fine in texture; florets 2; lemma black with white tip, midlong to long (17–20 mm); nerves 7, very obscure; palea medium narrow, black; spikelet separation by fracture, basal scar obscure, few to numerous, short to medium long basal hair present; floret separation by fracture, usually distal; awns numerous, twisted and geniculate; kernel medium slender; rachilla segment medium long and slender, very pubescent, numerous short to medium long hairs present; no hairs on lemma.

Black Norway C.I. 1874

Reg. No. 8

Description.—Juvenile growth upright; culm midstout; leaf midwide, light green; sheath and leaf nonpubescent.

Adult plant.—Midlate; midtall to tall (130–135 cm); culms 2–3, midstout, pubescence absent at nodes; plant color medium light green, leaf midwide to wide, ligule present; no pubescence on sheath or leaf margin; panicle equilateral, midlong (25–33 cm), and midwide to wide; rachis slightly flexuous, stout; nodes 6–7, false node absent; branches 24–28, midlong, stout, usually slightly raised; spikelets 53–70; glumes white, midlong (24–27 mm), rather coarse in texture; florets 2; lemma black, midlong (18–19 mm); nerves 7; palea midwide, black; spikelet separation by fracture, basal scar absent to very obscure; occasional short basal pubescence present; floret separation by fracture, distal; awns numer-

ous, straight to twisted, geniculate; rachilla segment short to midlong, and midslender; pubescence numerous, short; no hairs on lemma.

Bonda C.I. 4329

Reg. No. 108

Description.—Juvenile growth upright; culm medium stout, hairs on sheath absent; leaf narrow, medium dark green, no hairs on margin.

Adult plant.—Midearly; midtall (94–117 cm); culms 2–6, medium stout, no hairs above or below nodes; leaf midwide, ligule present, medium dark green, no hairs on sheath or leaf margins; panicle equilateral, medium long (14–20 cm), medium wide; rachis straight, somewhat flexuous; nodes 4–6, false node absent; branches (11–26) medium long, straight to raised; spikelets 17–31; glumes white, midlong (20–22 mm), fine to medium in texture; florets 2–3; lemma white, short to midlong (15–17 mm); nerves 5–9; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence occasional short; floret separation by hetero-fracture; awns numerous, twisted, and geniculate; kernel plump; rachilla segment short, medium to wide, nonpubescent; no hairs on lemma.

Bonham C.I. 4676

Reg. No. 161

Description.—Juvenile growth upright; culm medium stout, often slightly pink, hairs on sheath absent; leaf midwide, medium dark green, no hairs on leaf margin.

Adult plant.—Midearly; midtall (94–114 cm); culms 1–4, hairs at nodes absent; leaf medium wide, ligule present, dark green, hairs on sheath and leaf margins absent; panicle equilateral, midlong (12–25 cm), medium wide; rachis straight to flexuous; nodes 4–7, false node absent; branches (16–27) medium long, raised to straight; spikelets 12–39; glumes red, occasionally white, midlong (18–21 mm), fine to medium in texture; florets 2–3; lemma grayish red, short to midlong (15–17 mm); nerves 7; palea midwide, grayish red; spikelet separation by fracture, basal scar absent to obscure, occasional long basal hairs present; floret separation by hetero-fracture; awns occasional, straight; kernel plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Bonkee C.I. 7563**Reg. No. 211**

Description.—Juvenile growth medium upright; culm medium stout, often pink in color, no hairs on sheath or leaf margin, leaves midwide, medium dark green.

Adult plant.—Early; medium short (91–95 cm); culms 2–4, medium stout, hairs at nodes absent; leaf midwide, medium dark green, ligule present, no hairs on sheath or leaf margins; panicle equilateral, medium short (13–15 cm), and medium wide; rachis straight to flexuous; nodes 4–5, false node absent; branches (13–16) short, stiff, raised to straight; spikelets 20–25; glumes red, medium short (21–25 mm), medium coarse in texture; florets 2–3; lemma reddish yellow, flecked with gray, medium short (16–17 mm); nerves 7; palea wide, color gray flecked yellow; spikelet separation by fracture, basal scar obscure with occasional short to long basal pubescence; floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel very plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Boone C.I. 3305**Reg. No. 87**

Description.—Juvenile growth upright; culm medium stout, no hairs on sheath; leaves medium wide, medium dark green, pubescence usually absent.

Adult plant.—Medium early; medium tall (96–110 cm); culms 2–3, medium stout, no pubescence at nodes; leaf midwide, ligule present, no pubescence on sheath or leaves; panicle equilateral, midlong (15–25 cm), medium to wide; rachis straight, medium stout, often recurved, slightly flexuous; nodes 4–5, false node absent; branches (11–20) medium to long, straight to drooping; spikelets 20–30; glumes white to yellow, midlong (21–25 mm), texture variable, fine to coarse; florets 2; lemma yellow, but may be tinged with gray, medium long (15–18 mm); nerves 5–7; palea midwide, yellow; floret separation by fracture, basal scar absent to occasional very obscure scar, occasional short to medium long basal hair present; awns absent to few, usually straight or subgeniculate; kernel midplump; rachilla segment medium long and medium wide, nonpubescent; no hairs on lemma.

Branch C.I. 5013**Reg. No. 188**

Description.—Juvenile growth medium upright; culm stout, hairs on sheath absent; leaf midwide, medium light green, hairs on leaf margin absent.

Adult plant.—Midlate; midtall to tall (107–135 cm); culms 1–3, medium stout, numerous hairs above, few below nodes; leaf midwide, ligule present, no hairs on sheath or leaf margins; panicle equilateral, long (14–23 cm), and wide; rachis medium slender, straight to recurved; nodes 5–7, false node absent; branches (11–25), medium long and slender, straight to raised or drooping; spikelets 22–60; glumes often pinkish to red, medium long (17–22 mm), medium fine in texture; florets 2–3; lemma white to pinkish white, short (14–16 mm); nerves 5–7; palea wide, grayish yellow; spikelet separation by fracture, basal scar absent to obscure, with occasional long basal pubescence; floret separation by fracture, distal; awns occasional straight; kernel plump; rachilla segment short and slender, nonpubescent; no hairs on lemma.

Brave C.I. 7690**Reg. No. 196**

Description.—Juvenile growth medium upright; culm medium stout, few to no hairs on sheath; leaf midwide, medium dark green to slightly glaucous, no hairs on margin.

Adult plant.—Medium late; medium to tall (125–128 cm); culms 2–4, medium stout, no hairs at nodes; leaf medium wide, ligule present, slightly glaucous, no hairs on sheath or leaf margin; panicle equilateral, medium long (15–19 cm), medium wide; rachis straight to flexuous; nodes 6–7, false node absent; branches (12–21) medium long (8–9 cm), straight to slightly raised; spikelets 26–30; glumes white to reddish tinted, medium long (20–22 mm), coarse in texture; florets 2; lemma yellow, medium short (15–16 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, pubescence few, short; floret separation by fracture, distal or heterofracture; awns few, subgeniculate; kernel midplump; rachilla segment midlong (2–2.5 mm), slender, few short rachilla hairs present; no hairs on lemma.

Bridger C.I. 2611**Reg. No. 102**

Description.—Juvenile growth upright; culm stout, few to many hairs on sheath and leaf; leaf midwide, medium dark green.

Adult plant.—Midseason; very tall (130–160 cm); culms 2–3, very stout, pubescence numerous above, few below nodes, leaf midwide, ligule present, medium dark green, none to few hairs on sheath and leaves; panicle equilateral, midlong (21–25 cm), and wide (10–24 cm); rachis stout, straight to flexuous, often recurved at tip; nodes 5–7, false node absent; branches (20–30) long, stout, raised to straight; spikelets 29–50; glumes white, midlong (20–25 mm), medium to fine in texture; florets 2–3; lemma white, midlong (16–18 mm); nerves usually 7; palea wide, yellowish white; spikelet separation by fracture, basal scar absent to very obscure, pubescence occasional to few, short; floret separation by fracture, usually distal; awns occasional to few, straight to subgeniculate; kernel plump; rachilla segment short, midwide, nonpubescent; no hairs on lemma.

Brunker C.I. 2054**Reg. No. 73**

Description.—Juvenile growth upright; culm slender, very few short hairs on sheath; leaf narrow, medium dark green, hairs on leaf margins absent.

Adult plant.—Early; usually short (74–99 cm); culms 2–5, medium slender, occasional to numerous hairs below nodes; leaf midwide, ligule present, medium dark green, few or no hairs on sheath or leaf margin; panicle equilateral, short to medium (15–25 cm), usually widespread; rachis slender, recurved; nodes 4–5, false node absent; branches (12–15) slender, midlong, straight to drooping; spikelets 13–28; glumes white, midlong (22–25 mm), medium fine in texture; florets usually 2; lemma red, gray flecked, midlong to long (16–20 mm); nerves 5–7, prominent; palea narrow, red, gray flecked; floret separation by fracture, usually heterofracture, occasionally basifracture, basal scar absent to obscure with occasional to few long basal hairs; awns few, straight; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Burnett C.I. 6537**Reg. No. 140**

Description.—Juvenile growth upright; culm stout, hairs on sheath absent; leaf midwide, medium dark green, hairs on margin absent.

Adult plant.—Early; midtall (94–119 cm); culms 2–6, stout, occasional hairs below nodes; leaf midwide, ligule present, medium dark green, no hairs on sheath or leaf margin; panicle equilateral, short to midlong (14–19 cm), medium wide, rachis straight to somewhat flexuous; nodes 4–6, false node absent; branches (12–20) medium long, straight to drooping; spikelets 13–29; glumes red, midlong (17–21 mm), fine to coarse in texture; florets 2–3; lemma grayish red, short to midlong (15–17 mm); nerves 7; palea midwide, color grayish yellow to grayish red; spikelet separation by fracture, basal scar obscure, basal pubescence absent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short and medium wide, nonpubescent; no hairs on lemma.

Canadian C.I. 1625**Reg. No. 9**

Description.—Juvenile growth upright; culm medium stout, often red colored, no pubescence on sheath; leaf medium wide, medium dark green, numerous hairs on lower leaf margins.

Adult plant.—Midlate; midtall to tall (109–135 cm); culms 2–4, stout, no hairs at nodes; leaf midwide, ligule present, medium dark green, numerous hairs on leaf margins; panicle equilateral, long (20–28 cm), and wide (11–18 cm); rachis straight to very flexuous and often recurved; nodes 6–7, false node absent; branches (24–36) long, straight to raised; spikelets 57–91; glumes white, medium long (17–22 mm), fine in texture; florets usually 2; lemma yellowish white, short (13–16 mm); nerves 5–9 obscure; palea wide, white; spikelet separation by fracture, basal scar absent to obscure, pubescence absent, floret separation by fracture, distal; awns occasional, straight, subgeniculate to twisted and geniculate; kernel very plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Carleton C.I. 2378**Reg. No. 85**

Description.—Juvenile growth upright; culms midstout; leaf midwide, medium light green; no hairs on leaf sheath or margin.

Adult plant.—Early; midtall (105–110 cm); culms 3–5, midslender; nodes very pubescent, both above and below; leaf midwide, medium light green, ligule present, sheath and leaf slightly to nonpubescent; panicle equilateral, midlong (18–24 cm), and midwide (10–12 cm); rachis midslender, recurved at tip; nodes 5–6, false node absent; branches 17–25, short to midlong, slender, often drooping; spikelets 28–57; glumes white to light yellowish white, midlong (20–24 mm), medium fine in texture; florets 2; lemma yellow, midlong (17–18 mm); nerves 5–7, obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence occasional to few, midlong; floret separation by fracture, distal to heterofracture; awns few, straight; kernel midplump; rachilla segment midlong, very slender, nonpubescent; no hairs on lemma.

Cayuse C.I. 8263**Reg. No. 221**

Description.—Juvenile growth upright; culm midstout, no pubescence on sheath or leaf; leaves narrow, somewhat drooping, medium light green.

Adult plant.—Midearly; short (90–100 cm); culms 2–5, midstout; nodal pubescence few below; leaf midwide and somewhat raised in attitude, ligule present, medium light green; panicle equilateral, midlong (14–15 cm); rachis midstout, straight to slightly flexuous; nodes 6–7, false node absent; branches 13–15, midlong, straight to raised to drooping; spikelets 15–18; glumes light red; midlong (23–25 mm), coarse in texture; florets 2; lemma grayish red; midlong (16–18 mm); nerves 7, medium obscure; palea midwide, gray; spikelet separation by fracture, basal scar slight to obscure, basal pubescence few to numerous, medium long; floret separation by fracture, usually distal; awns numerous, usually twisted geniculate; kernel midplump; rachilla segment long (2.25–2.50 mm), midwide; nonpubescent; no hairs on lemma.

Cedar C.I. 3314**Reg. No. 103**

Description.—Juvenile growth upright; culm midstout; leaves midwide, medium dark green; no hairs on sheath or leaves.

Adult plant.—Early; midtall (100–118 cm); culms 2–4, midstout; pubescence on sheath absent, pubescence on nodes absent to occasional above; leaf midwide, medium dark green, ligule present, pubescence absent; panicle equilateral, midlong (13–16 cm), and midwide; rachis straight to slightly flexuous and sometimes recurved at tip; nodes 5–6, false node absent; branches (16–20) midlong, straight to slightly drooping; spikelets (16–28); glumes white to slightly reddish, midlong (19–21 mm), usually fine in texture; florets 2–3; lemma yellow to reddish yellow, midlong (15–17 mm); nerves 7; palea midwide, yellow to reddish yellow; spikelet separation by fracture, basal scar absent to very obscure; basal pubescence occasional, midlong to long; floret separation by fracture, distal to heterofracture; awns occasional, straight to subgeniculate; rachilla segment midlong to long and slender to midwide, nonpubescent; no hairs on back of lemma.

Centore C.I. 3865**Reg. No. 141**

Description.—Juvenile growth upright; culm medium stout, hairs on sheath absent; leaves medium dark green, narrow, no hairs on leaf margins.

Adult plant.—Midseason; short to midtall (84–114 cm); culms 1–4, medium stout, occasional hair above and below nodes; leaf medium narrow, ligule present, medium dark green, no hairs on leaves; panicle equilateral, midlong (17–20 cm), and wide (15–18 cm); rachis straight to recurved; nodes 4–6, false node absent; branches (11–26), long, raised to straight; spikelets 25–47; glumes white to pink, long (19–23 mm), fine to coarse in texture; florets 2–3; lemma yellow, midlong (16–18 mm); nerves 7; palea medium narrow, color yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence occasional, short; floret separation by fracture, distal; awns occasional, straight; kernel slender, rachilla segment medium long and medium slender, nonpubescent; no hairs on lemma.

Cherokee C.I. 3846**Reg. No. 114**

Description.—Juvenile growth medium to upright; culm stout, frequently pink in color, no hairs on sheath; leaf medium wide, medium dark green, no hairs on margin.

Adult plant.—Medium early; short to midtall (99–109 cm); culms 3–6, stout, no hairs at node; leaf midwide, flag leaf erect, ligule present, no hairs on sheath or leaf; panicle equilateral, midlong (15–21 cm), and wide (11–15 cm); rachis straight to flexuous; nodes 4–7, false node absent; branches (12–22) medium long, straight to raised; spikelets 15–38; glumes reddish yellow, midlong (20–25 mm), fine to coarse texture; florets 2–3, lemma gray flecked red, short to midlong (15–20 mm); nerves 5–7; palea midwide, gray, flecked red; spikelet separation by fracture, basal scar obscure, basal pubescence present, short to long; floret separation by heterofracture; awns occasional to numerous, straight, subgeniculate to twisted and geniculate; kernel plump; rachilla segment midlong and slender, nonpubescent; no hairs on lemma.

Clarion C.I. 5647**Reg. No. 163**

Description.—Juvenile growth upright; culm medium stout, often slightly red, no hairs on sheath; leaf midnarrow, medium dark green, no hairs on margins.

Adult plant.—Early; midtall (91–114 cm); culms 2–5, midstout, occasional hairs above and below nodes; leaf midwide, ligule present, medium dark green, no hairs on margin; panicle equilateral, midlong (13–18 cm), and medium wide (8–13 cm); rachis straight to slightly flexuous; nodes 4–6, false node absent; branches (16–23) medium long, straight to raised; spikelets 12–38; glumes white, medium long (16–23 mm), fine in texture; florets 2, usually; lemma yellow to gray flecked white, short to midlong (15–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture; basal scar absent, no basal hairs; floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium long, slender to midslender; pubescence absent; no hairs on lemma.

Clintland C.I. 6701**Reg. No. 148**

Description.—Juvenile growth upright; culm medium stout, often dark red, hairs on sheath absent; leaf midwide, medium dark green, no hairs on margins.

Adult plant.—Midearly; short to midtall (71–107 cm); culms 2–4, stout, no hairs at nodes; leaf midwide, medium dark green, ligule present, no hairs on sheath or leaf margins; panicle equilateral, midlong (11–18 cm), and wide (6–9 cm); rachis straight to slightly flexuous; nodes 5–7, false node absent; branches (12–21), medium short, straight to raised; spikelets 18–43; glumes white to pinkish, medium long (18–21 mm), fine in texture; florets 2; lemma yellow, short (15–16 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by heterofracture; awns absent to few, straight; kernel plump; rachilla segment medium long and medium wide; nonpubescent; no hairs on lemma.

Clinton C.I. 3971**Reg. No. 105****C.A.N. No. 698**

Description.—Juvenile growth upright; culm stout, often slightly red, hairs on sheath absent; leaf midwide, medium dark green, no hairs on margins.

Adult plant.—Midearly; midtall (102–112 cm); culms 2–4, stout, hairs numerous above nodes, few below; leaf midwide, ligule present, dark green, no hairs on sheath or leaves; panicle equilateral, midlong (15–25 cm), and midwide (9–10 cm); rachis straight to flexuous; nodes 4–6, false node absent; branches (14–21), medium long, raised to straight; spikelets 15–36; glumes white, midlong (17–22 mm), fine in texture; florets 2–3; lemma yellow, short to midlong (15–19 mm); nerves 5–7; palea wide, yellow; spikelet separation by fracture, short basal hairs present, basal scar absent; floret separation by heterofracture; awns occasional straight; kernel plump; rachilla segment medium long, slender, nonpubescent; no hairs on lemma.

Coachman C.I. 7684**Reg. No. 215**

Description.—Juvenile growth upright; culm stout, nonpubescent; no hairs on sheath; leaves midnarrow, no hairs on margins.

Adult plant.—Midseason; midtall (107–115 cm); culms 3–4, medium stout, slightly pink, no hairs at nodes; leaf midwide, ligule present, no hairs on leaves; panicle equilateral, midlong (15–25 cm), and midwide (6–8 cm); rachis usually straight; nodes 6–7, false node absent; branches (17–18), midlong (5–6 cm), attitude mostly raised; spikelets 24–27; glumes yellow, midlong (20–22 mm), fine in texture; florets usually 2; lemma reddish yellow, short (15–16 mm); nerves 5, obscure; palea wide, yellow; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by fracture, distal or heterofracture; awns numerous, twisted and geniculate; kernel very plump; rachilla segment long (2–2.5 mm) and very slender, nonpubescent; no hairs on lemma.

Cody C.I. 3916**Reg. No. 116**

Description.—Juvenile growth upright; culm medium slender, few to no hairs on culm or sheath; leaf medium wide, medium dark green, nonpubescent.

Adult plant.—Midseason; usually short to midtall (76–122 cm); culms 2–4, medium stout, few long hairs above nodes, occasional below; leaf midwide, ligule present, medium dark green, hairs on sheath and leaves absent; panicle equilateral, medium long (15–30 cm), and wide (9–15 cm); rachis medium slender, recurved; nodes 5–7, false node absent; branches (15–29) long, slender, straight to usually drooping; spikelets 23–48; glumes white, midlong (19–23 mm), medium fine in texture; florets usually 2; lemma yellow, midlong (16–17 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent, occasional short basal hairs present; floret separation by heterofracture; awns occasional, straight; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Colburt C.I. 2019**Reg. No. 43**

Description.—Juvenile growth upright; culm medium stout, pubescence occasional on culm, sheath and leaf margin, leaf midwide, medium dark green.

Adult plant.—Midearly; short (99–114 cm); culms 2–3, medium stout, pubescence occasional to few above and below nodes; leaf midwide, ligule present, medium dark green, occasional hair on sheath and leaf margin; panicle equilateral, medium long (15–25 cm), usually medium wide; rachis usually straight, slightly recurved; nodes 5–6, false node absent; branches (10–20) medium long, usually straight to slightly drooping; spikelets 20–30; glumes white, midlong (20–22 mm), fine to medium in texture; florets 2–3; lemma black with white tip, midlong (15–18 mm); nerves 5–7, obscure; palea midwide, black; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent to sparse, short; floret separation by fracture, usually distal; awns few, usually straight but occasionally subgeniculate; kernel midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Colfax C.I. 7595

Reg. No. 181

Description.—Juvenile growth medium upright; culm medium slender, sheath nonpubescent; leaves medium wide, medium dark green, nonpubescent.

Adult plant.—Medium early; midtall (104–112 cm); culms 3–5, medium slender, slight pubescence at nodes; leaf midwide, ligule present, medium dark green, few to no hairs on sheath or leaf margins; panicle equilateral, midlong (15–25 cm), and wide (11–14 cm); rachis medium stout, flexuous; nodes 5–6, false node absent; branches (14–18), midlong (5–7 cm), slightly drooping; spikelets 20–30; glumes white, midlong (15–20 mm), fine to medium coarse in texture; florets 2–3; lemma yellowish to grayish red, midlong (15–18 mm); nerves 5–7, prominent; palea midwide, gray, flecked with red; spikelet separation usually by fracture, basal cavity obscure, basal pubescence occasional, floret separation by heterofracture or basifracture; awns occasional, straight; kernel plump; rachilla segment midlong (1.5–2 mm), medium wide, nonpubescent; no hairs on lemma.

Colorado 37 C.I. 1640

Reg. No. 53

Description.—Juvenile growth upright; culm midstout to stout; leaf midwide; medium dark to grayish green, sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall (95–130 cm); culms 3–4, midstout to stout, usually nonpubescent at nodes, but occasional few hairs; leaf midwide, medium dark to grayish green; ligule present; leaf and sheath usually nonpubescent; panicle equilateral, midlong (15–25 cm), and midwide (8–10 cm); rachis usually straight, midslender, slightly flexuous; nodes 5–6, false node absent; branches (20–25), midlong, straight to slightly raised; spikelets 40–50; glumes white, midlong (22–24 mm); medium fine in texture; florets usually 2; lemma white, medium long (16–17 mm); nerves 5–7; palea midwide to wide, white; spikelet separation by fracture; basal scar absent to very obscure, basal pubescence occasional, short; floret separation by fracture, distal; awns occasional, subgeniculate to twisted geniculate; kernel midplump to plump; rachilla midlong, midslender; nonpubescent; no hairs on lemma.

Columbia C.I. 2820

Reg. No. 78

Description.—Juvenile growth upright; culm medium stout, pubescence on sheath absent; leaf medium narrow, medium dark green, no pubescence on margins.

Adult plant.—Medium early to early; midtall (114–117 cm); culms 2–4, medium stout, pubescence at nodes absent; leaf medium to narrow, ligule present, medium light green, pubescence on leaves absent; panicle equilateral, long (15–22 cm), and wide (10–18 cm); rachis straight to recurved; nodes 5–7, false node absent; branches (14–23) long, drooping; spikelets 18–44; glumes white, long (20–25 mm), fine in texture; florets usually 2; lemma reddish gray, midlong (16–18 mm); nerves 7, very prominent; palea narrow, reddish gray; spikelet separation by fracture, basal scar absent to obscure, occasional long basal pubescence; floret separation by heterofracture, occasionally by fracture, distal; awns occasional, usually straight, occasionally twisted and geniculate; kernel slender; rachilla segment medium long to long, slender, nonpubescent; no hairs on lemma.

Comewell C.I. 1317

Reg. No. 54

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green, sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall to tall (110–150 cm); culms 2–3, midstout, nodal pubescence few to numerous both above and below; leaf midwide, medium dark green, slightly glaucous; ligule present; sheath and leaf margins slightly pubescent to nonpubes-

cent; panicle equilateral, midlong (18–22 cm), and midwide (8–12 cm); rachis straight to recurved at tip, slightly flexuous, nodes 6–7, false node absent; branches 18–25, midlong, straight to slightly raised; spikelets 32–65; glumes white, sometimes slightly reddish tinged; medium to fine in texture; florets 2; lemma white to yellowish white; midlong (16–17 mm); nerves 7; palea midwide, grayish white to yellowish gray; spikelet separation by fracture; basal scar absent; basal pubescence absent to occasional, short to midlong hair present; floret separation by fracture, distal; awns occasional to numerous; straight to subgeniculate; kernel midplump; rachilla segment short, midwide; occasional short hair present; no hairs on lemma.

Cornellian C.I. 1242

Reg. No. 50

Description.—Juvenile growth upright; culm medium slender, often slightly red, pubescence on sheath absent; leaf medium dark green, narrow, no pubescence on margins.

Adult plant.—Midseason; midtall to tall (112–142 cm); culms 1–3, medium stout, numerous hairs above nodes, few below; leaf medium wide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, midlong (15–24 cm), and wide (13–18 cm); rachis straight to slightly flexuous, slender and recurved; nodes 5–7, false node absent; branches (15–28), medium long, slender, straight to drooping; spikelets 27–61; glumes white, medium long (17–21 mm), fine in texture; florets usually 2; lemma gray, short to midlong (15–17 mm); nerves 5–7, prominent; palea medium narrow, gray; spikelet separation by fracture, basal scar obscure with numerous short basal hairs present, florets separate by fracture, usually distal; awns occasional, straight; kernel slender; rachilla segment long and slender with no pubescence; no hairs on lemma.

Craig C.I. 5332

Reg. No. 128

Description.—Juvenile growth upright; culm very stout, no pubescence on sheath; leaf medium wide, medium dark green, no hairs on margins.

Adult plant.—Midlate; short to midtall (81–112 cm); culms 1–4, medium stout, hairs at nodes numerous above, few below; leaf medium narrow, ligule present, flag leaf erect, medium dark green, hairs on sheath and leaves absent; panicle equilateral, midlong (15–25 cm), and medium to wide (8–14 cm); rachis straight to

flexuous; nodes 4-6, false node absent; branches (14-25), long, slender, straight to drooping; spikelets 20-40; glumes white, midlong (19-25 mm), fine in texture; florets 2-3; lemma white to reddish yellow, short to midlong (15-18 mm); nerves 7; palea midwide, grayish yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal hairs present, floret separation by fracture, usually distal; awns numerous, subgeniculate to twisted and geniculate; kernel plump; rachilla segment short, medium to wide, occasional few short hairs present; no hairs on lemma.

Danish Island C.I. 1684

Reg. No. 11

Description.—Juvenile growth upright; culm stout, hairs very numerous on culm and sheath; leaf narrow to midwide, numerous hairs on leaf margin.

Adult plant.—Midseason; short to midtall (81-131 cm); 1-4 culms, stout, hairs at node numerous above and below; leaf medium narrow, ligule present, medium dark green, hairs on leaves few to absent; panicle equilateral, midlong (16-30 cm), somewhat spreading; rachis medium stout, flexuous; nodes 5-6, false node absent; branches (14-28), long, slender, raised to straight, drooping; spikelets 22-48; glumes white to grayish white, somewhat glaucous, midlong (19-25 mm), fine to medium in texture; florets 2-3; lemma white to yellow, somewhat glaucous, short to medium long (15-21 mm); nerves 5-7, prominent; palea midwide, white to yellow; spikelet separation by semiabscission, basal scar obscure, basal pubescence few to numerous, long; floret separation by fracture, distal or heterofracture; awns absent to numerous, straight to mostly twisted, geniculate; kernel slender to plump; rachilla segment long (2.5-2.75 mm), medium wide to slender, pubescence few, medium to short; no hairs on lemma.

Dawn C.I. 8029

Reg. No. 216

Description.—Juvenile growth upright; culm medium stout, slightly pink, no pubescence on sheath or leaf, leaf medium wide, medium dark green.

Adult plant.—Midlate; tall (135-142 cm); culms usually only 2, medium stout, hairs at nodes absent; leaf medium to wide, ligule present, flag leaf attitude medium upright to droopy; panicle equilateral, midlong (29-30 cm), and midwide; rachis very slender; nodes 7-8, false node absent; branches (13-21) long (10-14 cm) and

slender, drooping; spikelets 31-44; glumes very light red, midlong (20-21 mm), very fine in texture; florets usually 2; lemma light reddish yellow, very short (13-15 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar obscure to absent, occasional long basal hairs present; floret separation by fracture, usually distal; awns absent; kernel medium slender; rachilla segment long and very slender with occasional to few very short hairs present; no hairs on lemma.

Dodge C.I. 7269**Reg. No. 200**

Description.—Juvenile growth medium upright; culms stout, hairs on sheath absent; leaf medium wide, medium dark green, no hairs on margins.

Adult plant.—Midearly; midtall (100-110 cm); culms 2-4, stout, no hairs at nodes; leaf midwide, ligule present, no hairs on sheath or leaves; panicle equilateral, medium long (15-25 cm), and medium to wide (12-15 cm); rachis straight; nodes 5-6, false node absent; branches (16-20) long (7-10 cm), straight to slightly drooping; spikelets 26-36; glumes white or yellowish white, midlong (21-25 mm), medium coarse in texture; florets 2 or 3; lemma yellow, gray flecked, short to midlong (15-18 mm); nerves 7, obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, nonpubescent; floret separation by basifracture to heterofracture; awns numerous, straight; kernel medium plump; rachilla segment long (2-2.5 mm) and slender, nonpubescent; no hairs on lemma.

Dupree C.I 4672**Reg. No. 154**

Description.—Juvenile growth upright; culm medium slender, pubescence absent on sheath; leaf narrow, slight or no pubescence on leaf margin.

Adult plant.—Early; short (74-99 cm); culms 1-6, medium slender, no hairs at nodes; leaf medium narrow, ligule present, medium dark green, no hairs on sheath or leaves; panicle equilateral, midlong (15-25 cm), and wide (8-13 cm); rachis medium slender, straight; nodes 4-6, false node absent; branches usually 16-20, medium long, straight to raised; spikelets 15-30; glumes light reddish, midlong (17-23 mm), medium in texture; florets 2-3; lemma grayish red, short to midlong (14-17 mm); nerves 7, very prominent; palea midwide, grayish red; spikelet separation usually by fracture, basal scar absent to very obscure, basal pubescence

absent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment medium short and medium wide, nonpubescent; no hairs on lemma.

Early Champion C.I. 1623

Reg. No. 12

Description.—Juvenile growth very upright; culm slender, no hairs on sheath, leaf narrow, medium dark green, no pubescence on margins.

Adult plant.—Early; usually short (89–112 cm); culms 1–4, medium slender, sparse to numerous hairs at nodes, both above and below; leaf medium to narrow, ligule present, no hairs on leaves; panicle equilateral, midlong (13–15 cm), and medium wide (8–10 cm); rachis straight to recurved; nodes 4–6, false node absent; branches (12–22), usually medium long, raised; spikelets 20–40; glumes white, midlong (16–20 mm), fine in texture; florets usually 2; lemma white, short to medium (14–16 mm); nerves 5–7, obscure; palea medium narrow, white to yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence occasional, medium long, floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment medium to long, slender, and nonpubescent; no hairs on lemma.

Early Mountain C.I. 1624

Reg. No. 13

Description.—Juvenile growth upright; culm stout, slightly red, no hairs on sheath; leaf midwide, medium light green, few hairs on sheath or leaf.

Adult plant.—Midseason; midtall to tall (97–147 cm); culms 2–4, medium stout, no hairs at nodes; leaf medium narrow, ligule present, medium light green, occasional hair on leaves; panicle equilateral, medium long (18–28 cm), and medium wide; rachis medium slender, recurved; nodes 5–6, false node absent; branches (17–25) long and drooping; spikelets 19–50; glumes yellowish white to reddish white, midlong (20–24 mm), fine to coarse in texture; florets usually 2; lemma white, short to midlong (15–19 mm); nerves 5–7, very obscure; palea medium narrow, yellowish white to gray; spikelet separation by fracture, basal scar absent, occasional short basal hairs present; floret separation by fracture, distal; awns occasional, straight; kernel slender to medium plump; rachilla segment medium long, slender to medium wide, nonpubescent; no hairs on lemma.

Eaton C.I. 3908**Reg. No. 109**

Description.—Juvenile growth upright; culm stout, color pink, hairs on sheath absent; leaf midwide, dark green, no hairs on margins.

Adult plant.—Midearly; midtall (99–112 cm); culms 2–4, stout, no hairs at nodes; leaf midwide, ligule present, hairs on leaves absent; medium dark green; panicle equilateral, midlong (13–19 cm), and medium wide (8–11 cm); rachis straight to flexuous; nodes 5–7, false node absent; branches (14–21), medium short, straight to raised; spikelets 21–49; glumes white, long (17–20 mm), fine in texture; florets usually 2; lemma gray flecked white, short to midlong (14–17 mm); nerves 5–7; palea wide, gray flecked yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal hairs present; floret separation by fracture, distal to heterofracture; awns occasional, straight to numerous, subgeniculate to twisted and geniculate; kernel plump; rachilla segment medium long and medium slender, nonpubescent; no hairs on lemma.

Empire C.I. 1974**Reg. No. 55**

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf usually nonpubescent.

Adult plant.—Midseason; midtall (110–130 cm); culms 2–3, midstout; pubescence occasional to few present, above and below nodes; leaf midwide, medium dark green; ligule present; sheath and leaf margin usually nonpubescent; panicle equilateral, midlong (19–26 cm), and midwide (8–15 cm); rachis straight to slightly recurved, slightly flexuous; nodes 5–7, false node absent; branches 20–28, medium to midlong; usually straight to slightly raised; spikelets 29–50; glumes white to reddish white; midlong (20–25 mm), medium to fine in texture; florets 2, occasionally 3; lemma white, midlong (17–18 mm); nerves 7; palea midwide, white to grayish white; spikelet separation by fracture; basal scar absent to obscure, occasional short hair present; floret separation by fracture, usually distal, sometimes by heterofracture; awns occasional to few, straight to subgeniculate; kernel medium to slender; rachilla midlong, slender; occasional short to midlong hair present; no hairs on lemma.

Fayette C.I. 6916**Reg. No. 189**

Description.—Juvenile growth medium upright; culm stout, no pubescence on sheath or leaf margins; leaf medium wide, medium dark green.

Adult plant.—Midearly; midtall to tall (112–132 cm); culms 2–5, medium stout, nonpubescent; leaf medium wide, medium dark green, ligule present, no pubescence on sheath or leaf; panicle equilateral, medium long (15–25 cm), medium to wide; rachis straight to flexuous; nodes 5–7, false node absent; branches (15–25) medium long, straight to drooping; spikelets 14–39; glumes white, long (19–25 mm), medium fine in texture; florets 2–3; lemma white to yellow, short to midlong (15–17 mm); nerves 7, obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation by fracture, distal; awns occasional, straight; kernel medium plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Forvic C.I. 4164**Reg. No. 190**

Description.—Juvenile growth intermediate; culm medium stout, often pink, no hairs on sheath; leaf midwide, medium dark green, no hairs on margins.

Adult plant.—Midseason; midtall (99–119 cm); culms 1–5, medium stout, no hairs at nodes; leaf midwide, ligule present, hairs absent on sheath; panicle equilateral, midlong (13–25 cm), and medium to wide; rachis straight; nodes 4–6, false node absent; branches (12–22) often long, drooping; spikelets 29–51; glumes white, long (20–23 mm), medium fine in texture; florets 2, occasionally 3; lemma yellowish to white, short to midlong (15–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal pubescence present; floret separation by heterofracture; awns few to numerous, straight; kernel midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Forward C.I. 2242**Reg. No. 56**

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf usually nonpubescent.

Adult plant.—Midseason; midtall (110–138 cm); culms 2–4, midstout; pubescence at nodes, occasional to few above and below; leaf

midwide, medium dark green; ligule present; sheath and leaf margin usually nonpubescent; panicle equilateral, midlong (15–25 cm), and midwide to wide (11–15 cm); rachis long, straight to recurved; nodes 6–7, false node absent; branches 15–26, medium to long, straight to somewhat drooping; spikelets 40–70; glumes white, midlong (20–23 mm), medium fine in texture; florets 2–3; lemma white, midlong (17–18 mm); nerves 7; palea light yellow to grayish; spikelet separation by fracture; basal scar absent to obscure; basal pubescence absent to occasional, short to midlong hair present; floret separation by fracture, distal; awns occasional straight to subgeniculate; kernel midplump to slender; rachilla segment midlong and slender; rachilla pubescence absent to occasional, short; no hairs on lemma.

Franklin C.I. 2892

Reg. No. 79

Description.—Juvenile growth upright; culm medium stout, few long hairs on sheath; leaf midwide, medium dark green, no hairs on margins.

Adult plant.—Midearly; midtall (112–122 cm); culms 1–4, stout, few hairs below nodes, numerous above; leaf midwide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, midlong (15–25 cm), and midwide; rachis straight to slightly flexuous; nodes 4–6, false node absent; branches (16–20) medium long, straight to raised; spikelets 17–30; glumes white with reddish tinge, midlong (20–27 mm), medium in texture; florets 2–3; lemma usually reddish gray, midlong (16–17 mm); nerves 7; palea midwide, reddish gray; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Fulton C.I. 3327

Reg. No. 84

Description.—Juvenile growth upright; culm stout, occasional hairs on culm and sheath; leaf medium to wide, medium light green, few hairs on leaves.

Adult plant.—Early; short to midtall (81–127 cm); culms 2–5, medium stout, numerous hairs above nodes, few below; leaf medium wide, ligule present, medium light green, hairs on sheath and leaf absent; panicle equilateral, midlong (14–22 cm), and wide; rachis straight to recurved and slender; nodes 4–5, false node absent; branches (13–20) long, straight to raised and occasionally

straight to drooping; spikelets 15–22; glumes reddish colored, medium long (21–25 mm), medium coarse in texture; florets 2; lemma reddish, midlong to long (17–20 mm); nerves 7; palea midwide, reddish, gray flecked; spikelet separation by semiabscission to fracture, basal scar obscure to prominent, occasional long basal hair present; floret separation by heterofracture; awns occasional, straight; kernel medium slender; rachilla segment medium long and medium slender, nonpubescent; no hairs on lemma.

Garland C.I. 7453

Reg. No. 201

Description.—Juvenile growth medium upright; culm midstout, pubescence absent on culm and sheath; leaf midwide, somewhat glaucous, no hairs on leaves.

Adult plant.—Midseason; short to midtall (89–115 cm); culms 2–4, midstout, hairs at nodes absent; leaf midwide, ligule present, slightly glaucous, no hair on sheath or leaf margin; panicle equilateral, midlong (12–20 cm), and wide; rachis straight to flexuous; nodes 4–7, false node absent; branches (16–22) short, raised to straight; spikelets 25–32; glumes slightly pink to light reddish, slightly glaucous, midlong (18–21 mm), medium in texture; florets 2–3; lemma yellow, often grayish tinged, midlong (15–18 mm); nerves 7, very obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent, occasional medium long basal hair present; floret separation by heterofracture; awns occasional, straight; kernel very plump; rachilla segment short to midlong, slender to medium wide, nonpubescent; no hairs on lemma.

Garry (Improved) C.I. 6662

Reg. No. 164

C.A.N. 809

Description.—Juvenile growth upright; culm medium stout, often slightly red, no hairs on sheath, leaf medium to narrow, dark green, leaf margin nonpubescent.

Adult plant.—Midseason; midtall to tall (107–130 cm); culms 1–3, stout, hairs at nodes absent; leaf midwide, flag leaf upright, ligule present, dark green, hairs on sheath and leaves absent; panicle equilateral, midlong (15–25 cm), and medium wide; rachis straight to flexuous; nodes 5–7, false node absent; branches (16–30), medium long, straight to raised; spikelets 30–60; glumes white, midlong (17–21 mm), fine in texture; florets 2–3; lemma white to yellowish white, short to midlong (14–16 mm); nerves 7; palea wide, yellow to

reddish yellow; spikelet separation by fracture; basal scar absent to very obscure, pubescence absent; floret separation by fracture, distal or heterofracture; awns occasional, straight to subgeniculate; kernel very plump; rachilla segment short and medium to wide, nonpubescent; no hairs on lemma.

Garton No. 5 C.I. 1311

Reg. No. 14

Description.—Juvenile growth upright; culm midstout, hairs on sheath absent; leaf midwide, medium dark green, few hairs on edge of leaves.

Adult plant.—Midseason to late; midtall to tall (109–130 cm); culms 1–3, stout, few hairs above and below nodes; leaf midwide, ligule present, medium dark green, very pubescent; panicle equilateral, long (20–28 cm), and wide; rachis stout, stiff and straight; nodes 6–7, false node occasionally present; branches (15–30) midlong, usually raised; spikelets 40–75; glumes white, midlong (21–26 mm), fine in texture; florets 2; lemma white, midlong (16–17 mm); nerves 7; palea midwide, white to yellow; spikelet separation by fracture, basal scar obscure, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel midplump; rachilla segment medium long and medium slender with occasional short pubescence; no hairs on lemma.

Garton No. 473 C.I. 1883

Reg. No. 15

Description.—Juvenile growth intermediate to upright; culm stout, hairs on sheath absent; leaf midwide, medium dark green, hairs on lower leaf very numerous.

Adult plant.—Late; midtall to tall (91–142 cm); culms 1–3, stout, no hairs at nodes; leaf midwide, ligule present, hairs on leaves absent; panicle equilateral, long (20–30 cm), and wide; rachis very stout, straight; nodes 6–8, false node occasionally present; branches (19–29) very long, raised to straight and drooping; spikelets 46–101; glumes white, midlong (21–26 mm), medium coarse in texture; florets usually 2; lemma yellowish white, midlong (16–18 mm); nerves 7; palea very wide, yellowish white; spikelet separation by fracture, basal scar obscure, occasional to numerous short basal pubescence present; floret separation by fracture, distal; awns occasional to numerous, straight to twisted and geniculate; kernel plump; rachilla segment medium short and medium slender with occasional short pubescence; no hairs on lemma.

Goldcrest C.I. 7596**Reg. No. 182**

Description.—Juvenile growth upright; culm midstout, pink, pubescence absent on culm and sheath; leaf midwide, medium dark green, pubescence absent on margins.

Adult plant.—Early; short to midtall (90–97 cm); culms 3–4, stout, hairs at nodes absent; leaf midwide, ligule present, medium dark green, hairs on sheath and leaves absent; panicle equilateral, short (14–16 cm); rachis straight; nodes 5–6, false node absent; branches (16–20), midlong, straight to drooping; spikelets 18–20; glumes yellow to very light reddish, short (20–21 mm), very fine in texture; florets 2; lemma yellow, short (15–16 mm); nerves 5; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent, nonpubescent; floret separation by fracture, distal; awns absent; kernel midplump; rachilla segment midlong and slender, nonpubescent; no hairs on lemma.

Golden Rain C.I. 1890**Reg. No. 16**

Description.—Juvenile growth upright; culm stout; leaf midwide, medium dark green; leaf and sheath nonpubescent.

Adult plant.—Midseason; midtall (119–128 cm); culms 3–4, stout; no pubescence below, occasional above node; leaf midwide, medium dark green, nonpubescent, ligule present; panicle equilateral, midlong (18–23 cm), and midwide (10–15 cm); rachis straight to slightly flexuous; nodes 5–6, false node absent; branches 20–25, midlong, straight to slightly raised; spikelets 43–63; glumes yellow to slightly reddish yellow, midlong (18–19 mm), medium in texture; florets 2, lemma yellow, midshort to short (14–15 mm); nerves 5–7; palea yellow, wide; spikelet separation by fracture; basal scar absent, pubescence absent to occasional midlong hair; floret separation by fracture, distal; awns absent to occasional, short, straight to slightly subgeniculate; kernel very plump; rachilla segment midlong (1.5–1.75 mm), stout, nonpubescent; no hairs on lemma.

Goldfield C.I. 7597**Reg. No. 183**

Description.—Juvenile growth intermediate to upright; culm medium stout, slightly pink, hairs on sheath and culm absent; leaf medium wide, medium dark green, no hairs on leaves.

Adult plant.—Early; midtall (104–110 cm); culms 2–5, stout, hairs at nodes absent; leaf midwide, ligule present, medium dark green,

hairs on sheath and leaves usually absent; panicle equilateral, midlong (11–20 cm), and wide (8–10 cm); rachis straight to flexuous; nodes 5–9, false node absent; branches (14–18) usually short, straight to raised; spikelets 17–27; glumes white to slightly yellow, sometimes pinkish, midlong (22–23 mm), medium fine to coarse in texture; florets 2, occasionally 3; lemma yellowish white to reddish white, glaucous, midlong (17–18 mm); nerves 5–7, obscure; palea midwide, white; spikelet separation by fracture; basal scar absent to obscure, occasional long basal hairs present; floret separation by fracture, distal or heterofracture; awns numerous, straight to slightly subgeniculate; few hairs present on base of awns; kernel midplump; rachilla segment short to midlong, very slender to midwide, nonpubescent; no hairs on lemma.

Goodfield C.I. 7266**Reg. No. 198**

Description.—Juvenile growth upright; culm medium stout, slightly red in color, pubescence absent on sheath and leaf margins; leaf medium narrow, medium dark green.

Adult plant.—Midearly; short (80–90 cm); culms 3–5, stout, no hairs at nodes; leaf midwide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, short (12–15 cm), and wide (8–10 cm); rachis straight; nodes 4–6, false node absent; branches (13–19) short to medium long, straight to raised; spikelets 16–36; glumes white tinged with pink, medium long (18–20 mm), medium in texture; florets 2–3; lemmas yellow to reddish gray, very short to midlong (14–16 mm); nerves 7, obscure; palea midwide, gray flecked yellow to reddish yellow; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by heterofracture; awns numerous straight to twisted, geniculate; kernel medium to plump; rachilla segment medium long, very slender to medium wide, nonpubescent; no hairs on lemma.

Gopher C.I. 2027**Reg. No. 47**

Description.—Juvenile growth upright; culm medium stout, hairs on sheath and leaf margins absent; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall to tall (109–135 cm); culms 2–4, medium stout, pubescence present above and below nodes; leaf narrow to medium wide, ligule present, medium dark green, pubescence absent on leaves; panicle equilateral, midlong (14–20

cm), and wide; rachis straight to recurved; nodes 5-6, false node absent; branches (14-26), long, straight to drooping; spikelets 23-53; glumes white, midlong (18-22 mm), fine in texture; florets 2-3; lemma white, short to midlong (15-17 mm); nerves 5-7; palea midwide, white; spikelet separation by fracture, usually; basal scar usually absent, but occasionally obscure, basal pubescence occasional, short; floret separation by fracture, distal; awns occasional straight; kernel midplump; rachilla segment medium to long, slender, nonpubescent; no hairs on lemma.

Gothland C.I. 1898

Reg. No. 17

Description.—Juvenile growth very upright; culm stout, pubescence absent on sheath and leaf margins; leaf midwide, medium dark green.

Adult plant.—Late; midtall to tall (112-142 cm); culms 1-3, stout, few to numerous hairs below nodes, occasional above; leaf medium wide, ligule present, medium dark green, no hairs on leaves or sheath; panicle equilateral, midlong (17-20 cm), and wide (12-17 cm); rachis straight to recurved; nodes 4-6, false node absent; branches (12-22) long, straight to raised; spikelets 20-51; glumes white, midlong (20-24 mm), fine in texture; florets 2; lemma glaucous, white, long (18-20 mm); nerves 5-7; palea narrow, white to grayish white; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, short; floret separation by fracture, distal; awns numerous, straight, subgeniculate to twisted, geniculate; kernel slender; rachilla segment medium to long and slender, pubescence occasional, short; no hairs on lemma.

Green Russian C.I. 1978

Reg. No. 18

Description.—Juvenile growth upright; culm midstout, slightly red, pubescence absent on leaf and sheath; leaf narrow, medium dark green.

Adult plant.—Midlate; midtall to tall (109-137 cm); culms 1-3, midstout, occasional pubescence above and below nodes; leaf midwide, ligule present, medium dark green, pubescence absent on sheath and leaves; panicle equilateral, medium long (20-28 cm), and wide; rachis straight to recurved; nodes 5-7, false node absent; branches (17-34) long, straight to slightly raised; spikelets 35-65; glumes white, midlong (20-24 mm), fine in texture; florets 2; lemma yellowish white, midlong (15-19 mm); nerves 5-7; palea narrow, yellow; spikelet separation by fracture, basal scar absent,

occasional medium long basal hair present; floret separation by fracture usually, distal; awns numerous, straight, subgeniculate to twisted, geniculate; kernel slender; rachilla segment long and slender, occasional short hairs present; no hairs on lemma.

Grundy C.I. 8445

Reg. No. 249

Grundy is a short, moderately stiff-strawed oat adapted to the central and northern part of the Corn Belt. Grundy is early in maturity, produces medium-sized kernels that are predominantly light yellow. Hulls of 2.5 percent of the kernels fluoresce under ultraviolet light. Grundy has short, upright, dark-green leaves and semicompact panicles. (Frey and Browning 1972).

Hancock C.I. 3346

Reg. No. 88

Description.—Juvenile plant growth upright; culm midstout; leaf midwide, medium light green; few pubescence on sheath and leaf.

Adult plant.—Midearly; midtall (100–125 cm); culms 1–4; midstout, stiff, pubescence numerous above, numerous below node; leaf midwide, medium light green, tends to be raised in attitude; ligule present; sheath and leaf somewhat pubescent; panicle equilateral, midlong (15–20 cm), and midwide (15–18 cm); rachis straight to slightly flexuous; nodes 4–5, false node absent; branches 12–23, midlong; straight to raised; spikelets 20–38; glumes yellow, midlong (21–24 mm), medium to fine in texture; florets 2, occasionally 3; lemma yellow to reddish yellow at base; midlong (16–18 mm); nerves 7; palea midwide, yellow to grayish yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, short; floret separation by fracture, usually distal; awns absent to occasional, straight; kernel midplump; rachilla segment medium to long, nonpubescent; no hairs on lemma.

Holden C.I. 7978

Reg. No. 224

Description.—Juvenile growth upright; leaf midwide, medium dark green; pubescence on leaf and sheath absent.

Adult plant.—Midseason; short (80–90 cm); culms 3–4, stout, pubescence absent at nodes; leaf midwide, medium dark green, nonpubescent; ligule present; panicle equilateral, short (17–18 cm),

and midwide; rachis straight to flexuous; nodes 6-7, false node absent; branches 15-18, midlong, midstout, usually raised; spikelets 15-24; glumes reddish yellow, midlong (21-22 mm), medium coarse in texture; lemma red to light red, short (13-14 mm); nerves 9; palea midwide to wide; reddish yellow; spikelet separation by abscission, semiabscission, or fracture; basal scar obscure, when present, wide; pubescence numerous, very short, floret separation by fracture, basal to heterofracture; awns occasional, straight to subgeniculate; kernel wide (very plump); rachilla segment very short and wide, nonpubescent; no hairs on back of lemma.

Huron C.I. 3756

Reg. No. 96

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf slight to no pubescence.

Adult plant.—Midseason; midtall (120-125 cm); culms 2-3, midstout, pubescence numerous above, few below nodes; leaf midwide, medium dark green; ligule present; sheath and leaf nonpubescent; panicle equilateral, midlong (18-25 cm), and wide (15-18 cm); rachis straight to slightly flexuous; nodes 5-6, false node absent; branches 16-25, midlong to long, straight, raised to drooping; spikelets 27-48; glumes white, midlong (21-23 mm), medium to fine in texture; florets 2; lemma yellow to reddish yellow; midlong (16-18 mm); nerves 7; palea midwide, yellow to grayish flecked; spikelet separation by fracture; basal scar absent to obscure; basal pubescence absent to occasional, short; floret separation by fracture, distal to heterofracture; awns present, occasional to numerous; straight, subgeniculate to twisted, geniculate; kernel slender to midplump; rachilla segment midlong, midwide, nonpubescent; no hairs on lemma.

Idamine C.I. 1834

Reg. No. 57

Description.—Juvenile growth upright; culm midstout; sheath and leaf nonpubescent; leaves midwide, medium dark green.

Adult plant.—Midseason; midtall (105-125 cm); culms 2-4, mid-sized; nodal pubescence occasional, above and below; leaf midwide, medium dark green; ligule present; sheath and leaf nonpubescent; panicle midlong (18-22 cm), midwide (12-15 cm); rachis straight, recurved, slightly flexuous; nodes 6-7, false node absent; branches 19-25, midlong to long; attitude straight to raised to drooping; spikelets 36-66; glumes white, midlong (19-21 mm), fine in texture; florets 2, lemma white, midlong (17-18 mm); nerves 7, obscure;

palea midwide, yellowish white; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, short; floret separation by fracture, distal; awns occasional, straight; rachilla segment midlong, slender; occasional short rachilla hair present; no hairs on back of lemma.

Logold C.I. 2329**Reg. No. 72**

Description.—Juvenile growth upright; culm stout, often slightly red; pubescence absent on sheath and leaf margins; leaf midwide, medium dark green.

Adult plant.—Early; midtall (97–107 cm); culms 1–3, medium stout, pubescence at nodes absent; plant color medium dark green; leaf medium narrow, ligule present, no pubescence on sheath or leaves; panicle equilateral, short to midlong (14–25 cm), medium wide; rachis straight to slightly flexuous, slender, recurved; nodes 4–6, false node absent; branches (16–24) medium long, straight to drooping; spikelets 18–46; glumes white, midlong (18–22 mm), fine in texture; florets usually 2; lemma light yellow, midlong (15–18 mm); nerves 5–7; palea narrow, grayish yellow; spikelet separation by fracture, basal scar absent, occasional few short to medium long basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Logren C.I. 2024**Reg. No. 51**

Description.—Juvenile growth upright; culm slender; pubescence absent on sheath and leaf; leaf midwide; medium dark green, no hairs on margins.

Adult plant.—Midearly; midtall (95–115 cm); culms 1–4, midstout, occasional pubescence above and below nodes; leaf midwide, ligule present, pubescence usually absent on sheath and leaf; panicle equilateral, midlong (20–28 cm), and wide (10–11); rachis straight to flexuous, often slightly recurved; nodes 5–7, false node absent; branches 17–30, long, straight to raised to drooping; spikelets 30–60; glumes white to yellowish white, midlong (20–23 mm), fine in texture; florets 2; lemma yellowish white to yellow, midlong (17–19 mm); nerves 7; palea narrow, yellow; spikelet separation by fracture, basal scar absent, occasional midlong basal hair present; floret separation by fracture, usually distal; awns occasional to few, usually straight, but occasionally subgeniculate; kernel slen-

der, rachilla segment long and slender, usually nonpubescent, but occasional short hair present, no hairs on lemma.

Iowar C.I. 847

Reg. No. 48

Description.—Juvenile growth upright; culm midstout; sheath and leaf medium dark green, nonpubescent.

Adult plant.—Early to midearly; midtall (94–117 cm); culms 2–3, midstout; nodes, sheath and leaf nonpubescent; leaf midwide, ligule present, medium dark green; panicle equilateral, midlong (15–25 cm), and midwide; rachis straight to slightly recurved and flexuous; nodes 4–6, false node absent; branches 15–20, midlong, straight to drooping; spikelets 20–40; glumes white, midlong (21–25 mm), medium fine in texture; florets 2–3; lemma white, midlong (16–18 mm); nerves 7, obscure; palea midwide, white with grayish tinge; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence sparse to occasional, midlong; floret separation by fracture, distal; awns few to numerous, straight to subgeniculate; kernel slender, rachilla segment midlong to long, slender, nonpubescent; no hairs on lemma.

Irish Victor C.I. 1896

Reg. No. 19

Description.—Juvenile growth upright; culm medium stout; leaf midwide, medium to dark green, glaucous, nonpubescent.

Adult plant.—Midearly; midtall (105–125 cm); culms 2–3; pubescence absent at nodes; plant color medium dark green, somewhat glaucous; leaf midwide, ligule present, usually occasional to no hairs on sheath or leaves; panicle equilateral, short to midlong (17–22 cm), and midwide; rachis slender, straight to slightly flexuous; somewhat recurved at tip; nodes 5–6, false node absent; branches 15–24, midlong, slender, straight to slightly drooping; spikelets 28–40; glumes white, sometimes reddish tinged; midlong (21–22 mm), medium in texture; florets 2; lemma yellowish white, sometimes tinged with gray, medium long (17–20 mm); nerves 7; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent, basal pubescence absent to occasional, midlong; floret separation by fracture, distal; awns occasional, straight to subgeniculate; kernel slender to midplump; rachilla segment very short to midlong, nonpubescent; no hairs on lemma.

Ithacan C.I. 2141**Reg. No. 58**

Description.—Juvenile growth upright; culms stout, slight to no pubescence on sheath or leaves; leaf midwide, medium dark green, slightly glaucous.

Adult plant.—Midseason; midtall (110–130 cm); culms 2–4, stout, pubescence few to absent on sheath or leaf, few to absent above and below nodes; leaf midwide, medium dark green, slightly glaucous, ligule present, hairs on margins few to absent; panicle equilateral, midlong (14–26 cm), and midwide; rachis straight to slightly flexuous, frequently slightly recurved at tip; nodes 6–7, false node absent; branches 15–25, midlong, straight to raised; spikelets 30–72; glumes white, midlong (20–22 mm), fine to medium coarse in texture; florets 2, often 3; lemma white to slightly yellow, midlong (15–18 mm); nerves 5–7; palea midwide, white to slightly gray; spikelet separation by fracture; basal scar absent, basal pubescence occasional, midlong hair present; floret separation by fracture, usually distal; awns occasional to few, usually straight to slightly subgeniculate; kernel midplump to plump; rachilla segment midlong and medium slender; nonpubescent; no hairs on lemma.

Jackson C.I. 5441**Reg. No. 159**

Description.—Juvenile growth upright; culm stout, often slightly red; pubescence absent on sheath and leaf margins; leaf medium wide; plant medium dark green.

Adult plant.—Midearly; short to midtall (86–124 cm); culms 2–4, pubescence absent at nodes; leaf midwide, often raised in attitude, ligule present, plant color medium dark green, pubescence absent on sheath and leaves; panicle equilateral, midlong (15–25 cm), and wide (9–13 cm); rachis straight to slightly flexuous; nodes 5–6, false node absent; branches (15–20) medium long, straight to raised; spikelets 15–40; glumes white, midlong (18–22 mm), medium fine in texture; florets 2, occasionally 3; lemma yellowish white, short to midlong (15–18 mm); nerves 7; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent to obscure, occasional short to long basal pubescence present, floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Japan C.I. 1889**Reg. No. 20**

Description.—Juvenile growth upright; culms midstout; leaf midwide, medium dark green; pubescence on sheath and leaf occasional to absent.

Adult plant.—Midseason; midtall (120–135 cm); culms 2–3, stout, pubescence absent to occasional both above and below node; leaf midwide, medium dark green, ligule present, usually nonpubescent; panicle equilateral, midlong (22–34 cm), and midwide; rachis straight to flexuous, usually recurved at tip; nodes 5–6, false node absent; branches (20–28) midlong, slender, straight to drooping; spikelets numerous (38–80); glumes yellowish white, midlong (19–20 mm), fine in texture; lemma yellow, midlong (15–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture; basal scar absent to very obscure, few to many, usually midlong pubescence; floret separation by fracture, distal; awns absent to occasional, straight; kernel midplump; rachilla segment long and very slender, nonpubescent; no hairs on back of lemma.

Jaycee C.I. 7971**Reg. No. 218**

Description.—Juvenile growth upright; culm stout, slightly pink; pubescence absent on sheath and leaf margins; leaf wide, medium dark green.

Adult plant.—Early; short to midtall (80–105 cm); culms 2 medium stout, no hairs at nodes; leaf wide, flag leaf very droopy, ligule present, no hairs on sheath or margins; panicle equilateral, midlong (23–25 cm), and midwide; rachis straight to slightly flexuous; nodes 6–7, false node absent; branches (20–21) long (9–14 cm), usually raised in attitude; spikelets 40–43; glumes very light red, medium long (20–21 mm), medium coarse in texture; florets usually 2; lemma very light red, very short (13–14 mm); nerves 7; palea wide, light red; spikelet separation by fracture; basal scar absent to obscure, few long basal hairs; floret separation by fracture, heterofracture or distal; awns straight to subgeniculate; kernels very short and very plump; rachilla segment long (2–2.5 mm) and slender, nonpubescent; no hairs on lemma.

Jewell C.I. 7598**Reg. No. 184**

Description.—Juvenile plant upright, midstout, slightly pink in color; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midearly; midtall (98–105 cm); culms 2–3, midstout; nonpubescent at nodes; leaf midwide, medium dark green; ligule present; leaf and sheath nonpubescent; panicle equilateral, midlong (18–23 cm), and midwide (10–13 cm); rachis straight to slightly flexuous; nodes 6–7, false node absent; branches 15–16, midshort (5–7 cm), usually straight to slightly drooping; spikelets 19–22; glumes yellow, slightly reddish, midlong (22–23 mm), medium coarse in texture; florets 2–3; lemma light yellowish white, midlong (17–18 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture; basal scar absent; pubescence absent; floret separation by fracture, distal to heterofracture; awns numerous, straight to subgeniculate; kernel medium plump; rachilla segment midlong (2–2.25 mm), midwide, nonpubescent; no pubescence on lemma.

Joanette C.I. 1880

Reg. No. 21

Description.—Juvenile growth medium to upright; culms medium slender; few short pubescence present on sheath; leaf narrow, medium light green, pubescence absent on margins.

Adult plant.—Midseason; midtall (97–122 cm); culms 1–3, small to medium stout, few hairs above and below nodes; leaf medium narrow, medium light green, ligule present, hairs on leaves absent; panicle equilateral, midlong (17–24 cm), and wide; rachis medium slender, straight to recurved; nodes 5–6, false node absent; branches (18–24) long, straight to drooping; spikelets 20–47; glumes white, midlong (21–23 mm), fine to medium in texture; florets 2; lemma black with white tip, midlong (16–18 mm); nerves 7, prominent; palea midwide, black; spikelet separation by fracture, basal scar obscure, occasional medium to long basal pubescence; floret separation by fracture, distal; awns occasional to numerous, straight, nontwisted, but dark on lower portion; kernel midplump; rachilla segment medium in length and width, rachilla hairs occasional, medium long; no hairs on lemma.

Kanota C.I. 839

Reg. No. 66

Description.—Juvenile growth semiupright; culm stout, frequently slightly pink; no pubescence on sheath; leaf medium wide, medium light green; very occasional pubescence on leaf margins.

Adult plant.—Midearly; short to midtall (79–137 cm); culms 1–4, occasional hairs above and below nodes; plant color medium light green; leaf medium wide, ligule present, hairs on sheath and

leaves few to absent; panicle equilateral, midlong (11–28 cm), and medium wide; rachis straight to slightly flexuous; nodes 4–6, false node absent; branches (12–25) medium short, raised, straight to drooping; spikelets 18–30; glumes red, midlong (20–25 mm), medium to coarse in texture; florets 2–3; lemma red to grayish red, midlong (16–18 mm); nerves 7, prominent; palea midwide, gray to gray flecked red; spikelet separation by abscission, to fracture; basal scar obscure to prominent, occasional few long basal hairs present; floret separation by fracture, usually basal, occasionally distal or heterofracture; awns occasional, straight; kernel medium to plump; rachilla segment short to medium long, medium wide, nonpubescent; no hairs on lemma.

Keystone C.I. 2146

Reg. No. 68

Description.—Juvenile plant upright; culm midstout; leaf midwide; medium dark green; few pubescence on sheath and leaf.

Adult plant.—Midearly; midtall (118–135 cm); culms 2–3, midstout, with few to numerous pubescence above and below nodes; leaf midwide, ligule present, medium dark green sheath and leaf, usually few or no pubescence; panicle equilateral, midlong (17–23 cm), and midwide; rachis midstout, straight to slightly recurved at tip; nodes 4–6, false node absent; branches (15–25) midlong, usually straight to slightly raised; spikelets (38–60); glumes white, midlong (19–22 mm), medium coarse in texture; florets 2–3; lemma white, midlong (16–18 mm); nerves 7; palea midwide, white; spikelet separation by fracture; shape of base usually pointed without scar; basal pubescence absent; floret separation by fracture, distal; awns usually absent, but occasional, straight; kernel midplump; rachilla segment midlong and slender, nonpubescent; no hairs on back of lemma.

Kherson C.I. 459

Reg. No. 22

Description.—Juvenile growth upright; culm medium stout, slightly pink; leaf medium wide, pubescence absent on sheath and leaf margins; plant medium dark green.

Adult plant.—Medium early; midtall (94–117 cm); culms 3–4, pubescence occasional above and below nodes; plant color medium dark green; leaf medium wide to narrow, ligule present, no hairs on sheath or leaves; panicle equilateral, short (11–20 cm), and medium wide; rachis straight to slightly flexuous, recurved, slen-

der; nodes 4-6, false node absent; branches (11-20) medium long, straight to drooping; spikelets 18-53; glumes white, midlong (17-20 mm), fine in texture; florets 2; lemma yellow, medium short (15-17 mm); nerves 5-7; palea medium narrow, yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional short basal pubescence; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment medium in length and slender, nonpubescent; no hairs on lemma.

Kota C.I. 8178

Reg. No. 227

Description.—Juvenile growth upright; culm medium stout; slight or no pubescence on sheath or leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall (92-100 cm); culms 2-4, midstout, nodal pubescence absent; leaf midwide, ligule present, medium dark green; no pubescence on sheath or leaf; panicle equilateral, midlong (15-25 cm), midwide; rachis straight to very slightly flexuous; nodes 6-7, false node absent; branches 12-18, midlong (7-9 cm), straight to raised; spikelets 20-24; glumes very light reddish, midlong (20-22 mm), fine in texture; florets 2-3; lemma yellow, midlong (16-17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent or very obscure; basal pubescence very occasional, very short; floret separation by fracture, distal; awns absent; kernel very plump; rachilla segment very short, wide, nonpubescent; no hairs on back of lemma.

Lenroc C.I. 3205

Reg. No. 80

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall (105-130 cm); culms 2-4, midstout; pubescence at nodes occasional above and below; leaf midwide, medium dark green; ligule present; sheath and leaf nonpubescent; panicle equilateral, midlong (20-24 cm), and midwide (13-18 cm); rachis straight to recurved at tip, slightly flexuous; nodes 6-7, false node absent; branches 18-26, long, straight to slightly drooping; spikelets 45-54; glumes white to yellowish white, midlong (19-23 mm), medium to fine in texture; florets 2; lemma white to yellowish white; midlong (16-17 mm); nerves 7; palea midwide, yellow to yellowish white; spikelet separation by fracture; basal scar absent; basal pubescence absent to few short; floret separation by fracture, distal to occasionally heterofracture; awns absent

to numerous, straight to subgeniculate; kernel slender to midwide; rachilla segment midlong and slender; pubescence absent to occasional, very short; no hairs on lemma.

Lincoln C.I. 1262**Reg. No. 23**

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall (125–135 cm); culms 2–3, midstout to stout; none to slight pubescence at nodes; leaf midwide, medium dark green, slightly glaucous; ligule present; sheath and leaf nonpubescent; panicle equilateral, midlong (20–24 cm), and midwide (10–12 cm); rachis midstout, straight; nodes 5–6, false node absent; branches 24–27, midlong, midstout, straight to drooping; spikelets 33–52; glumes white, midlong (20–21 mm), medium in texture; florets 2, occasionally 3; lemma white, darker to grayish at base, midlong (16–17 mm); nerves 7, prominent; palea midwide, white, grayish tinged; spikelets separate by fracture; basal scar absent to very obscure, basal pubescence occasional, short to midlong; floret separation by fracture, distal; awns numerous, straight to subgeniculate; kernel plump; rachilla segment short to midlong, midwide, nonpubescent; no hairs on lemma.

Lodi C.I. 7561**Reg. No. 202**

Description.—Juvenile growth intermediate; culm very stout; pubescence absent on sheath and leaf margins; leaf wide, medium dark green.

Adult plant.—Late; tall (130–135 cm); culms 1–3, stout, hairs on nodes absent; plant color medium dark green, slightly glaucous; leaf medium wide, ligule present, hairs on leaves absent; panicle equilateral, midlong (23–25 cm), and wide; rachis medium stout, slightly flexuous, recurved; nodes 6–8, false node absent; branches (15–17) long (9–10 cm), straight to drooping; spikelets 25–34; glumes yellow, midlong (18–22 mm), fine in texture; florets 2; lemma yellow, medium short (16–17 mm); nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar absent, occasional short basal pubescence; floret separation by fracture, distal; awns absent; kernel very plump; rachilla segment midlong and medium wide, nonpubescent; no hairs on lemma.

Macon C.I. 6625**Reg. No. 168**

Description.—Juvenile growth upright; culm medium slender, pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midearly; midtall (100–104 cm); culms 1–4, medium slender, no hairs above or below nodes; leaf narrow to medium wide, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (15–25 cm), and wide (9–15 cm); rachis mid-stout, straight to flexuous; nodes 5–6, false node absent; branches (15–22), medium slender, midlong (5–8 cm), straight to drooping; spikelets 12–40; glumes white to grayish red, midlong (22–24 mm), medium fine to coarse in texture; florets 2–3; lemma red to grayish red, midlong to long (17–21 mm); nerves 7, prominent; palea midwide, yellow to reddish gray; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional, short; floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium long and slender, rachilla hairs occasional, very short to medium long; no hairs on lemma.

Madrid C.I. 603**Reg. No. 24**

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaf margins; leaf medium wide, medium dark green.

Adult plant.—Midlate; midtall to tall (112–132 cm); culms 2–4, few to numerous hairs above and below nodes; leaf midwide, ligule present, plant color medium dark green, no hairs on sheath or leaves; panicle equilateral, midlong (17–24 cm), and medium to wide (9–11 cm); rachis slender, straight to recurved; nodes 5–7, false node absent; branches (15–24) medium long, straight to raised; spikelets 16–57; glumes yellowish white, midlong (18–23 mm), fine to medium fine in texture; florets 2–3; lemma yellow, very short to midlong (14–19 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional short basal hairs present; floret separation by fracture, distal; awns numerous, straight; kernel slender to midplump; rachilla segment medium long and slender, rachilla hairs occasional, short to long; no hairs on lemma.

Mahaska C.I. 7599**Reg. No. 185**

Description.—Juvenile growth upright; culm medium to slender; pubescence absent on sheath and leaf margins; young stem color reddish.

Adult plant.—Very early; medium short (95–99 cm); culms 3–5, pubescence absent above and below nodes; leaf midwide, ligule present, no hairs on sheath or leaves, medium light green; panicle equilateral, short (15–18 cm), and narrow; rachis straight to flexuous; nodes 4–6, false node absent; branches (15–20) short (7–10 cm), straight to raised to upright, often raised in attitude, usually one or more almost parallel to rachis; spikelets 25–28; glumes reddish white, midlong (22–23 mm), coarse in texture; florets 2–3; lemma red, gray flecked, midlong (17–20 mm); nerves 5–7, obscure; palea midwide, gray flecked yellow; spikelet separation by fracture, basal scar absent, basal pubescence occasional, long; floret separation by heterofracture; awns occasional, straight; kernel midplump; rachilla segment midlong (2–2.25 mm), medium wide, nonpubescent; no hairs on lemma.

Marida C.I. 2571⁷**Reg. No. 100**

Description.—Juvenile growth upright; culm midstout; sheath and leaf nonpubescent; leaves midwide, medium dark green, slightly glaucous.

Adult plant.—Midseason; midtall (120–135 cm); culms 2–4, midstout; nodal pubescence numerous above, occasional to few below; leaf midwide, medium dark green, ligule present; sheath and leaf nonpubescent; panicle midlong (18–22 cm), midwide to wide (12–18 cm); rachis straight, slightly flexuous, recurved at tip; nodes 5–6, false node absent; branches 22–30, long, attitude straight to raised to drooping; spikelets 32–49; glumes white, midlong (22–23 mm), fine in texture; florets 2–3, lemma white to grayish flecked white, midlong (17–18 mm); spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasionally present, usually short; floret separation by fracture, distal; awns occasional, straight to subgeniculate; rachilla segment midlong, medium wide to slender, nonpubescent; no hairs on back of lemma.

⁷ Minton, C.I. 2574, a sister strain to Marida differs morphologically only slightly from Marida.

Marion C.I. 3247**Reg. No. 89**

Description.—Juvenile growth upright; culm medium stout, very slightly pink; no pubescence on sheath or leaves; leaf midwide; plant medium dark green.

Adult plant.—Midearly; midtall (104–122 cm); culms 2–5, stout, numerous hairs above nodes, few below; plant color medium dark green; leaf narrow to midwide, ligule present, hairs on leaves absent; panicle equilateral, midlong (15–25 cm), and wide (10–18 cm); rachis usually straight to recurved; nodes 4–6, false node absent; branches (11–25) long, straight to drooping; spikelets 14–58; glumes white, midlong (19–22 mm), fine in texture; florets 2; lemma white, gray flecked, midlong (16–19 mm); nerves 5–7; palea midwide, white, gray flecked; spikelet separation by fracture, basal scar absent to obscure, occasional short basal hairs present; floret separation by fracture, either distal or heterofracture; awns occasional, straight; kernel slender to medium plump; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Markton C.I. 2053**Reg. No. 52**

Description.—Juvenile growth upright; culm stout; pubescence very numerous on culms and leaves; leaf narrow, plant color medium light green.

Adult plant.—Midseason; midtall (107–122 cm); culms 2–4, stout; numerous hairs above nodes, few below; plant color light yellowish green; leaf midwide, ligule present, occasional hairs on sheath and leaves; panicle equilateral, long (18–24 cm), and widespread (18–20 cm); rachis straight to recurved, medium slender; nodes 5–7, false node absent; branches (11–25) very long and drooping; spikelets 23–34; glumes yellowish white, long (23–29 mm), medium to coarse in texture; florets usually 2; lemma yellow to reddish yellow, midlong to long (16–20 mm); nerves 7, prominent; palea midwide, yellow to reddish yellow; spikelet separation by fracture, basal scar obscure, occasional short to medium long basal hairs; floret separation by fracture, distal or heterofracture; awns numerous, subgeniculate to twisted and geniculate; kernel midplump; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Miami C.I. 2245**Reg. No. 76**

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall (125–130 cm); culms 2–3, midstout; pubescence at nodes; few to numerous above and below; leaf midwide, medium dark green; ligule present; sheath and leaf slightly to nonpubescent; panicle equilateral, midlong (15–20 cm), and midwide (12–15 cm); rachis straight to flexuous, recurved at tip; nodes 5–7, false node absent; branches 17–23, midlong, straight to drooping; spikelets 23–41; glumes white to yellowish white, occasionally slightly red in color, midlong (21–24 mm), fine to medium coarse in texture; florets 2–3; lemma white, tinged with reddish gray, midlong (16–18 mm); nerves 7; palea medium wide, white tinged with yellowish gray; spikelets separate by fracture; basal scar absent to obscure; basal pubescence present, numerous, short to midlong; florets separate by fracture, usually distal, occasionally by heterofracture; awns numerous, straight to twisted geniculate; kernel medium plump; rachilla segment midlong and midwide, nonpubescent; no hairs on lemma.

Mindo C.I. 4328**Reg. No. 107**

Description.—Juvenile growth upright; culm medium stout, slightly red; pubescence absent on sheath and leaf margins; leaf narrow to midwide, medium dark green.

Adult plant.—Early; short to midtall (79–114 cm); culms 3–5, stout, slight or no pubescence at nodes; leaf medium narrow, ligule present, semierect, medium dark green, no hairs on sheath or margins; panicle equilateral, midlong (15–25 cm), medium to wide; rachis straight to somewhat flexuous, recurved; nodes 4–6, false node absent; branches (13–20) medium long, straight to drooping; spikelets 20–34; glumes white, midlong (17–24 mm), fine in texture; florets 2–3; lemma white to yellowish white, short to long (14–19 mm); nerves 5–7; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent to very obscure with occasional short to long basal pubescence; floret separation by heterofracture; awns numerous, straight; kernel medium plump; rachilla segment short to midlong, slender to medium wide, nonpubescent; no hairs on lemma.

Minhafer C.I. 6913**Reg. No. 143**

Description.—Juvenile growth medium upright; culm medium stout, reddish in color, no pubescence on sheath; leaf narrow, few hairs on lower leaf margin; plant medium dark green.

Adult plant.—Late; midtall to tall (99–152 cm); culms 2–4, moderate hairs above nodes, few below; leaf medium wide, ligule present, dark green, moderate hairs on leaf margins and sheath; panicle equilateral, midlong (14–25 cm), and wide (15–20 cm); rachis slightly flexuous, straight to recurved; nodes 5–6, false node absent; branches (18–21) medium to long, raised, straight to drooping; spikelets 13–35; glumes white to red, long (21–27 mm), coarse in texture; florets 2–3; lemma reddish yellow, midlong to long (17–21 mm); nerves 7; palea midwide, reddish yellow; spikelet separation by fracture, basal scar obscure, basal pubescence occasional, medium long; floret separation by fracture, distal to heterofracture; awns numerous, straight to twisted, geniculate; kernel midplump; rachilla segment short and wide with occasional short rachilla hairs; no hairs on lemma.

Minland C.I. 6765**Reg. No. 144**

Description.—Juvenile growth upright; culm medium stout, numerous pubescence on sheath; leaf midwide, medium light green, pubescence absent on margins.

Adult plant.—Midearly; short to midtall (84–112 cm); culms 3–5, medium stout, few to numerous hairs above and below nodes; leaf midwide, very drooping, ligule present, medium light green, hairs on sheath and leaves present; panicle equilateral, midlong (11–18 cm), and wide (11–15 cm); rachis midstout, straight; nodes 4–6, false node absent; branches (10–21) long, straight to drooping; spikelets 14–34; glumes white to red, long (25–30 mm), coarse in texture; florets 2–3; lemma yellow to reddish gray, midlong to long (17–21 mm); nerves 7; palea narrow, white to gray flecked red; spikelet separation by fracture, basal scar obscure, occasional short to long basal pubescence; floret separation by heterofracture; awns occasional, straight; kernel medium slender; rachilla segment medium long, slender to medium wide, pubescence occasional, short; no hairs on lemma.

Minota C.I. 1285**Reg. No. 59**

Description.—Juvenile growth upright; culm slender, pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midseason; midtall to tall (104–130 cm); culms 2–3, pubescence absent at nodes; leaf midwide, ligule present, no hairs on sheath and leaves, plant color dark green; panicle equilateral, midlong (15–25 cm), and wide; rachis straight to slightly flexuous; nodes 5–6, false node absent; branches (20–30) medium to long, straight to drooping; spikelets 27–59; glumes white to reddish white, long (18–25 mm), fine to medium fine in texture; florets 2; lemma yellowish white, short to midlong (15–19 mm); nerves 7; palea narrow, yellow; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Mission C.I. 2588**Reg. No. 104**

Description.—Juvenile growth medium upright; culms midstout; sheath and leaf margin nonpubescent; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall (110–140 cm); culms 2–4, midstout, pubescence absent to occasional above node; leaf midwide, ligule present, medium dark green, occasional or no pubescence on sheath or leaf; panicle equilateral, midlong (20–23 cm); rachis midstout, straight; nodes 6–7, false node absent; branches 25–27, midlong, straight to raised; spikelets 24–39; glumes white, midlong (25–26 mm), medium fine in texture; florets 2; lemma white to grayish tinged, midlong (19–20 mm); nerves 5–7, obscure; palea midwide, white to yellowish white; spikelet separation by fracture, basal scar absent, nonpubescent; floret separation by fracture, distal; awns occasional, straight; kernel medium slender; rachilla segment midlong, slender, nonpubescent; no hairs on back of lemma.

Mo. 0-200 C.I. 4626**Reg. No. 125**

Description.—Juvenile growth upright; culm medium stout, red; pubescence absent on sheath and leaves; leaf narrow, medium green.

Adult plant.—Midearly; short to midtall (89–112 cm); culms 2–4, medium stout, no hairs at nodes, leaf narrow and somewhat erect; ligule present, pubescence absent on sheath and leaf, plant color medium green; panicle equilateral, midlong (13–25 cm), medium wide; rachis slightly flexuous, slender, recurved; nodes 4–5, false node absent; branches (14–29) medium to long, straight to raised or drooping; spikelets 19–50; glumes white to slightly red, midlong (16–22 mm), fine in texture; florets 2–3; lemma red to reddish gray, short to midlong (15–17 mm); nerves 7, prominent; palea narrow to midwide, grayish red; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, long; floret separation by heterofracture; awns very occasional, straight; kernel slender to midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Mo. 0-205 C.I. 4988

Reg. No. 126

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf narrow, medium light green.

Adult plant.—Early; midtall to tall (97–130 cm); culms 2–5, pubescence absent at nodes; leaf narrow, ligule present, no hairs on sheath or leaves, plant color medium light green; panicle equilateral, midlong (12–25 cm), and wide; rachis medium slender, straight, recurved; nodes 5–6, false node absent; branches (13–21) medium long, slender, drooping; spikelets 20–35; glumes white, midlong (20–25 mm), fine in texture; florets 2, often 3; lemma grayish red, short to midlong (15–18 mm); nerves 7, prominent; palea midwide, gray; spikelet separation by fracture, basal scar absent, occasional short basal hairs present; floret separation by fracture, distal or heterofracture; awns occasional, straight; kernel slender to midplump, small, third kernel usually present; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Mohawk C.I. 4327

Reg. No. 127

Description.—Juvenile growth upright; culm medium stout, frequently colored red; pubescence absent on sheath and leaf margins; leaf midwide, medium dark green.

Adult plant.—Midearly; short to midtall (89–112 cm); culms 2–5, pubescence absent at nodes; leaf medium wide, ligule present, no

pubescence on sheath or leaves; plant color medium dark green; panicle equilateral, midlong (15–25 cm), narrow to midwide; rachis stout, straight to flexuous; nodes 4–6, false node absent; branches (15–23) short to medium long, straight to raised; spikelets 14–51; glumes white, midlong (17–22 mm), fine in texture; florets 2–3; lemma yellow, short to midlong (15–17 mm); nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar absent to very obscure with occasional medium long basal hair; florets separate by heterofracture; awns occasional, straight; kernel plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Monarch C.I. 1876

Reg. No. 25

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midlate; midtall to tall (102–130 cm); culms 1–3, stout, no hairs at nodes; leaf medium wide, ligule present, no hairs on sheath or leaves, plant color medium dark green; panicle equilateral, midlong (15–25 cm), and medium wide; rachis slender, straight to recurved; nodes 4–6, false node absent; branches (18–30) long, straight to drooping; spikelets 21–37; glumes white, midlong (19–24 mm), fine in texture; florets 2; lemma black to dark brown, somewhat glaucous, midlong (17–18 mm); nerves 5–7, prominent; palea midwide, black; spikelet separation by fracture, basal scar very obscure, pubescence occasional, short to medium long; floret separation by fracture, distal; awns occasional, straight, subgeniculate to twisted, geniculate; kernel medium slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Multiline E68 C.I. 8345

Reg. No. 242

This is a composite of 10 near-isogenic lines using C.I. 7970 as the recurrent parent.

Description of variable but predominant type.—Juvenile growth medium upright; culm midstout; very occasional hair on sheath and leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall (100–110 cm); culms 2–3, midstout, nodal pubescence absent or slight; leaf midwide, ligule present, medium dark green, no pubescence on sheath or leaf;

panicle midlong (16–18 cm), midwide; rachis straight to slightly flexuous; nodes 6–7, false node absent; branches 17–20, midlong, straight to raised; spikelets 17–20; glumes reddish yellow, midlong (20–21 mm), medium fine in texture; florets 2–3; lemma yellow, midlong (16–18 mm); nerves 7, obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence very occasional, very short; floret separation by heterofracture to basifracture; awns very occasional, straight; kernel plump; rachilla segment short (1.5–1.75 mm), wide, nonpubescent; no hairs on back of lemma.

Multiline E69
Reg. No. 243

Approximately same description as for Multiline E68. E69 is a composite of eight near-isogenic lines using C.I. 7970 as the recurrent parent.

Multiline E70
Reg. No. 244

Approximately same description as for Multilines E68 and E69. E70 is a composite of six near-isogenic lines using C.I. 7970 as the recurrent parent.

Multiline M68 C.I. 8346
Reg. No. 245

This is a composite of eight near-isogenic lines using C.I. 7555 as the recurrent parent.

Description of variable but predominant type.—Juvenile growth upright; culm midstout; slight or no pubescence on sheath or leaf; leaf medium dark green.

Adult plant.—Midearly; midtall (100–110 cm); culms 3–4, midstout, nodes nonpubescent; leaf midwide, medium dark green, ligule present; few to no pubescence on leaf or sheath; panicle midlong (15–18 cm), midwide; rachis midstout, straight to slightly flexuous; usually 7 nodes, false node absent; branches 12–15, short, straight to raised; spikelets 22–34; glumes yellow, midlong (18–21 mm), medium fine in texture; florets usually 2; lemma light yellow, midshort (15–16 mm); nerves usually 7, rather obscure; palea yellow, midwide; spikelet separation by fracture, basal scar absent to very obscure, pubescence occasional, short; floret separation by fracture, distal to heterofracture; awns usually absent, very occasional, straight; kernel midplump; rachilla segment short, midwide, nonpubescent; no hairs on back of lemma.

Multiline M69**Reg. No. 246**

Approximately same description as for Multiline M68. M69 is a composite of nine near-isogenic lines using C.I. 7555 as the recurrent parent.

Multiline M70**Reg. No. 247**

Approximately same description as for Multilines M68 and M69. M70 is a composite of seven near-isogenic lines using C.I. 7555 as the recurrent parent.

Neal C.I. 7440**Reg. No. 192**

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaves; leaf medium narrow.

Adult plant.—Early; medium short (102–104 cm); culms 2–4, stout, pubescence present above and below nodes; leaf midwide, ligule present, pubescence absent on sheath and leaves, plant color green; panicle equilateral, midlong (20–25 cm), and narrow; rachis straight to flexuous; nodes 5–6, false node absent; branches (10–19) short, raised; spikelets 21–28; glumes red, midlong (19–22 mm), medium coarse in texture; florets 2–3; lemma reddish yellow, midlong (16–17 mm); nerves 7; palea wide, grayish yellow; spikelet separation by fracture, basal scar absent to very obscure, few short to medium long basal hairs; floret separation by fracture, distal; awns occasional, straight; kernel very plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Nehawka C.I. 7194**Reg. No. 170**

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf midwide to narrow, medium dark green.

Adult plant.—Midearly; short (89–95 cm); culms 2–6, medium stout, pubescence absent at nodes; leaf midwide, ligule present, nonpubescent; panicle equilateral, short (11–16 cm), and wide; rachis straight to flexuous; nodes 4–5, false node absent; branches (12–20) short to medium long, straight to drooping; spikelets 13–24; glumes reddish yellow, midlong (21–23 mm), medium fine to medium coarse in texture; florets 2–3; lemma yellow to reddish white, midlong (16–17 mm); nerves 7, prominent; palea midwide, reddish

yellow, gray flecked; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence numerous, short; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short and slender, rachilla hairs occasional, short; no hairs on lemma.

Nemaha C.I. 4301

Reg. No. 115

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf wide, medium dark green.

Adult plant.—Midearly; short to midtall (76–102 cm); culms 1–5, stout, pubescence at nodes absent; leaf medium narrow, ligule present, attitude erect, pubescence absent, plant color medium dark green; panicle equilateral, short (11–17 cm), and wide (8–9 cm); rachis straight to flexuous; nodes 4–6, false node absent; branches (10–20) short, straight to raised; spikelets 13–30; glumes red to pinkish yellow, midlong (18–25 mm), fine to medium in texture; florets 2–3; lemma reddish yellow, often gray flecked, short to midlong (14–17 mm); nerves 5–7; palea wide, gray flecked red; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, long; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short and medium to wide, nonpubescent; no hairs on lemma.

Neosho C.I. 4141

Reg. No. 112

Description.—Juvenile growth upright; culm stout; pubescence absent on sheath and leaves; leaf narrow, medium dark green.

Adult plant.—Early; short to midtall (84–107 cm); culms 1–5, stout, hairs at nodes absent; leaf medium to narrow, ligule present, hairs on sheath and leaves absent, medium dark green; panicle equilateral, midshort (12–20 cm), and wide; rachis straight, slightly flexuous; nodes 4–5, false node absent; branches (11–21) medium to long, straight to raised; spikelets 14–28, glumes pink, midlong (18–25 mm), medium to coarse in texture; florets 2–3; lemma grayish white to grayish red, short to midlong (15–18 mm); nerves 5–7; palea midwide, grayish red; spikelet separation by fracture, basal scar obscure, basal pubescence few to numerous, long; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Newton C.I. 6642**Reg. No. 151**

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf medium to wide, medium dark green.

Adult plant.—Midearly; midtall (94–109 cm); culms 2–5, occasional pubescence above node, few or none below; leaf medium wide, ligule present, hairs on leaves absent, medium dark green; panicle equilateral, medium short (15–19 cm), and wide; rachis straight to flexuous; nodes 5–6, false node absent; branches (10–21) short to midlong, raised to straight; spikelets 15–35; glumes reddish to pink, midlong (17–24 mm), medium to coarse in texture; florets 2–3; lemma reddish yellow to reddish gray, short to midlong (15–17 mm); nerves 7; palea midwide, grayish white to reddish gray; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, long; florets separate by heterofracture; awns numerous, straight, subgeniculate to twisted, geniculate; kernel plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Niagara C.I. 7528**Reg. No. 194**

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Late; midtall to tall (102–137 cm); culms 2, stout; few to numerous hairs above nodes, few below; plant color medium dark green, nonglaucous; leaf midwide, ligule present, hairs on leaves absent; panicle equilateral, midlong (15–25 cm), and wide; rachis straight to flexuous; nodes 5–7, false node absent; branches (12–20) usually raised, long; spikelets 29–34; glumes white, midlong (21–22 mm), fine to medium in texture; florets 2–3; lemma white to yellowish gray, short (15–16 mm); nerves 7; palea wide, yellow to gray; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, short; floret separation by heterofracture; awns occasional to numerous straight to subgeniculate; kernel plump to very plump; rachilla segment very slender, short to midlong, nonpubescent; no hairs on lemma.

Nodaway C.I. 7272**Reg. No. 179**

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf midwide, medium light green.

Adult plant.—Medium early; midtall to tall (104–142 cm); culms 2–4, stout, hairs on nodes absent; leaf midwide, ligule present, no hairs on sheath or leaves, plant medium light green; panicle equilateral, midlong (17–20 cm), and wide (14–15 cm); rachis straight to flexuous and recurved; nodes 6–7, false node absent; branches (15–28) long (8–10 cm), straight, raised to drooping; spikelets 25–50; glumes white, midlong (20–23 mm), medium fine in texture; florets 2–3; lemma grayish white to red, short to midlong (15–17 mm); nerves 7; palea wide, white to grayish yellow; spikelet separation by fracture, basal scar absent to obscure, few very long basal hairs present; floret separation by heterofracture; awns few to numerous, straight to subgeniculate; kernel medium to very plump; rachilla segment long (2–3 mm), medium slender to very slender, occasional short rachilla hairs present; no hairs on lemma.

Nodaway 70 C.I. 8442**Reg. No. 239**

Plant type and seed characteristics of Nodaway 70 are similar to those of Nodaway. Nodaway 70 is derived from a panicle selection from Nodaway and is a more uniform variety.

North Finnish C.I. 1882**Reg. No. 26**

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf narrow, medium dark green.

Adult plant.—Midseason; midtall to tall (102–135 cm); culms 1–3, stout, few to numerous hairs above and below nodes; plant color medium dark green; leaf medium wide, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (18–28 cm), and midwide; rachis straight to recurved; nodes 4–7, false node absent; branches (14–23) slender, long, straight, raised to drooping; spikelets 24–85; glumes white, midlong (22–25 mm), fine in texture; florets 2; lemma brown to black with white tips, midlong to long (17–20 mm); nerves 7, prominent; palea midwide, brown to black;

spikelet separation by fracture, basal scar absent to obscure, numerous short basal hairs present; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment long and slender, few short rachilla hairs present; no hairs on lemma.

O'Brien C.I. 8174

Reg. No. 220

Description.—Juvenile growth upright; culm midstout; slight to no pubescence on sheath or leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; short (90–96 cm); culms 2–5, midstout; nodal pubescence absent; leaf midwide, ligule present, medium dark green, no pubescence on sheath or leaf, panicle equilateral, midlong (17–20 cm), medium wide (8–10 cm); rachis straight to slightly flexuous; nodes 7–8, false node absent; branches 16–22, midlong, usually straight to raised; spikelets 21–32; glumes very light reddish yellow, midlong (19–20 mm), medium in texture; florets 2, occasionally 3; lemma yellow, midlong (15–16 mm); nerves 7, obscure; palea midwide, light reddish yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, very short; floret separation by heterofracture; awns absent; kernel very plump; rachilla segment very short (1.5–1.75 mm), medium wide, nonpubescent; no hairs on back of lemma.

Old Island Black C.I. 1756

Reg. No. 27

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall to tall (94–132 cm); culms 1–4, medium stout, hairs on nodes absent; plant color medium dark green; leaf midwide, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (16–28 cm), and wide (9–16 cm); rachis straight, slender, recurved; nodes 5–7, false node absent; branches (18–28) long, drooping; spikelets 23–52; glumes white, midlong (20–25 mm), fine in texture; florets 2; lemma black with white tips, short to midlong (16–18 mm); nerves 5–7; palea narrow, black; spikelet separation by fracture, basal scar obscure, numerous short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment

medium long and slender, numerous short rachilla hairs present; occasional long hairs on lemma.

Oneida C.I. 7458

Reg. No. 176

Description.—Juvenile growth upright; culm medium slender, occasional hairs on sheath and leaves; leaf medium wide, medium light green.

Adult plant.—Midlate; midtall (119–128 cm); culms 2–4, hairs on nodes absent; plant color medium light green; leaf midwide, ligule present, hairs present on sheath and leaves; panicle equilateral, midlong (14–15 cm), and midwide; rachis straight to flexuous; nodes 5–6, false node absent; branches (14–22) medium long, straight to raised; spikelets 23–34; glumes white, midlong (21–22 mm), fine in texture; florets 2–3; lemma yellowish white to white, midlong (17–18 mm); nerves 7; palea midwide, reddish yellow to gray; spikelet separation by fracture, basal scar absent to obscure, short to medium long basal pubescence present; floret separation by fracture, distal; awns absent; kernel medium slender to plump; rachilla segment medium in length, slender to medium wide, few medium long rachilla hairs present; no hairs on lemma.

Orbit C.I. 7811

Reg. No. 203

Description.—Juvenile growth semidecumbent; culm stout, pubescence absent on sheath and leaves; leaf intermediate in width, medium green.

Adult plant.—Medium late; midtall (106–112 cm); culms 2–4, stout, hairs on nodes variable, some below; leaf midwide, ligule present, leaf color medium green, very slightly glaucous, hairs on sheath and leaves absent; panicle equilateral, short (16–20 cm), wide (8–9 cm); rachis flexuous; nodes 6–7, false node absent; branches (16–17) midlong (8–9 cm), straight to raised; spikelets 19–30; glumes yellow, midlong (21–22 mm), medium in texture; florets 2; lemma yellow tinged with red, midlong (16–17 mm); nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar absent to obscure, pubescence absent; floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel very plump; rachilla segment long (2–2.5 mm), medium slender, occasional very short rachilla hairs present; no hairs on lemma.

Ortley C.I. 7473**Reg. No. 186**

Description.—Juvenile growth intermediate; culm very stout, pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Medium late; midtall (93–120 cm); culms 2–5, stout, hairs at nodes absent; plant color medium dark green, slightly glaucous; leaf midwide, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (15–25 cm), midwide (7–9 cm); rachis stout, flexuous; nodes 6–7, false node absent; branches (16–20) midlong (6–9 cm); spikelets 25–40; glumes yellow to light red, midlong (19–20 mm), fine in texture; florets 2; lemma yellow, short (14–15 mm); nerves 7; palea wide, yellowish white; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by heterofracture; awns absent; kernel very plump; rachilla segment midlong (2–2.25 mm) and slender, pubescence absent; no hairs on lemma.

Osage C.I. 3991**Reg. No. 111**

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaves; leaf medium narrow, medium dark green.

Adult plant.—Early; short (86–100 cm); culms 2–5, medium stout, no hairs on sheath or culms; leaf medium wide, medium dark green, drooping, ligule present, no hairs on margins; panicle equilateral, midlong (15–24 cm), and midwide; rachis medium slender, straight to recurved; nodes 4–6, false node absent; branches (12–20) medium to long, slender, drooping; spikelets 15–30; glumes red, often tinted pink, midlong (18–22 mm), fine to medium coarse in texture; florets 2–3; lemma yellow to reddish yellow, midlong (17–19 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence very few, medium to long; floret separation by fracture, distal to heterofracture; awns few, straight; kernel midplump; rachilla segment medium long, slender to midwide, nonpubescent; no hairs on lemma.

Otoe C.I. 2886**Reg. No. 98**

Description.—Juvenile growth upright; culm midslender, medium dark green; sheath and leaf slightly to nonpubescent.

Adult plant.—Early; midtall (100–117 cm); culms 2–4, slender to midstout, nonpubescent at nodes; leaf midwide, medium dark green; ligule present; sheath and leaf nonpubescent; panicle equilateral, midlong (12–16 cm), and midwide (7–10 cm); rachis slender, recurved at tip; nodes 4–5, false node absent; branches (12–17), midlong, straight to drooping; spikelets 16–29; glumes white, midlong (22–24 mm), texture medium to fine; florets 2–3; lemma light reddish gray, midlong (17–19 mm); nerves 7, obscure; palea midwide to narrow, grayish yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional to few present, short to very short; floret separation by fracture, distal to heterofracture; awns usually absent; kernel slender; rachilla segment midlong, midwide, nonpubescent; no hairs on back of lemma.

Otter C.I. 8304

Reg. No. 237

Description.—Juvenile growth upright; culm midstout; leaf midwide; pubescence slight or absent on sheath and leaf margins; plant color medium light green.

Adult plant.—Midearly; short to midtall (85–115 cm); culms 2–4, stout, occasional pubescence at nodes; leaf midwide, medium light green, ligule present; pubescence occasional on sheath and leaf margins; panicle equilateral, long (22–27 cm), and wide (7–9 cm); rachis straight to slightly flexuous; nodes 7–8, false node absent; branches 21–23, midlong (8–12 cm), usually raised in attitude; spikelets 45–53; glumes light yellowish red, midlong (20–22 mm), texture medium coarse; florets 2–3; lemma yellowish white, midlong (17–18 mm); nerves 7, obscure; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence occasional, short; awns occasional, short, straight; kernel midplump; rachilla segment short (1.5–1.75 mm), midslender, nonpubescent; no hairs on back of lemma.

Overland C.I. 4181

Reg. No. 117

Description.—Juvenile growth upright; culm stout; sheath nonpubescent; leaf midwide, medium dark green, nonpubescent.

Adult plant.—Midseason; short to midtall (86–117 cm); culms 2–3, stout, hairs at nodes absent; leaf midwide, ligule present, hairs on sheath and leaves absent, medium dark green; panicle equilateral, midlong (13–18 cm), and wide (8–15 cm); rachis straight to slightly flexuous; nodes 4–5, false node absent; branches (12–32) medium

long, straight to raised; spikelets 16–35; glumes white, midlong (17–23 mm), fine in texture; florets 2–3; lemma white, short to midlong (15–18 mm); nerves 7; palea wide, white to yellowish white; spikelet separation by fracture, basal scar absent to obscure, occasional short to medium long basal pubescence; floret separation by fracture, distal; awns occasional, straight; kernel plump; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Park C.I. 6611

Reg. No. 160

Description.—Juvenile growth medium upright; culm very stout, pubescence absent on sheath and leaves; leaf medium wide, dark green.

Adult plant.—Midseason; midtall (94–127 cm); culms 1–3, no hairs at nodes; plant color dark green; leaf medium wide, very upright in attitude, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (14–25 cm), and midwide (8–13 cm); rachis stout, straight to flexuous; nodes 4–6, false node absent; branches (15–25) midlong, stout, straight to raised; spikelets 20–40; glumes white, midlong (18–20 mm), fine to medium in texture; florets 2–3; lemma white, short (14–16 mm); nerves 5–7; palea wide, white to yellowish white; spikelet separation by fracture, basal scar obscure, occasional, short basal pubescence present; floret separation by fracture, distal or heterofracture; awns occasional, straight to subgeniculate; kernel very plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Patterson C.I. 2147

Reg. No. 69

Description.—Juvenile growth upright; culm midstout; slight or no pubescence on sheath or leaf; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall (125–145 cm); culms 1–4, midstout, nodal pubescence few above and below; leaf midwide, ligule present, medium dark green, no pubescence on sheath or leaf; panicle midlong (20–25 cm), midwide; rachis straight to recurved at tip; nodes 5–6, false node absent; branches 15–26, midlong, straight to drooping; spikelets 32–60; glumes white, midlong (19–23 mm), fine in texture; florets 2; lemma white to yellowish white, midlong (16–18 mm); nerves 7; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent or obscure, basal pubescence absent to occasional, short; floret separation by fracture,

distal; awns occasional, straight to subgeniculate; kernel midplump; rachilla midlong and slender, nonpubescent; no hairs on back of lemma.

Pettis C.I. 7805

Reg. No. 229

Description.—Juvenile plant upright; culm midstout; no pubescence on sheath and leaf; leaf midwide, medium light green.

Adult plant.—Midearly; midtall (105–125 cm); culms 3–4, midslender, nodal pubescence absent; leaf midwide, medium light green, ligule present, no pubescence on leaf or sheath; panicle midlong (18–25 cm), midwide; rachis slender, flexuous, slightly recurved at tip; nodes 6–8, false node absent; branches 12–18, midlong, slender, raised to drooping; spikelets 15–20; glumes yellowish white to light red, midlong (18–20 mm), medium fine in texture; florets 2; lemma slightly grayish red, midlong (16–17 mm); nerves 7, obscure; palea medium narrow, reddish to grayish tinged; spikelet separation by fracture, basal scar absent to very obscure; basal pubescence absent to occasional long hair present; floret separation by fracture, distal to heterofracture; awns occasional, straight to subgeniculate; kernel midslender; rachilla segment midlong and slender, nonpubescent; no hairs on back of lemma.

Portage C.I. 7107

Reg. No. 199

Description.—Juvenile growth semidecumbent; culm medium stout; pubescence absent on culm, sheath, and leaves; leaf medium to narrow, medium dark green.

Adult plant.—Medium late; midtall to tall (112–142 cm); culms 2–5, medium stout, no pubescence on sheath or nodes; leaf midwide, ligule present, pubescence absent on leaves, medium dark green, slightly glaucous; panicle equilateral, midlong (15–25 cm), and wide (10–12 cm); rachis straight to flexuous; nodes 4–6, false node absent; branches (15–20) midlong (9–10 cm), straight to raised; spikelets 22–31; glumes white to slightly pink, midlong (19–22 mm), fine to medium coarse in texture; florets 2–3; lemma white, yellow to gray flecked, short (14–16 mm); nerves 7, obscure; palea wide, usually yellow; spikelet separation by fracture, basal scar obscure, occasional short basal pubescence present; floret separation by fracture, distal or heterofracture; awns occasional to numerous, straight, subgeniculate to very few twisted, geniculate; kernel plump; rachilla segment short to medium long (1.5–2.5 mm) and slender, nonpubescent; no hairs on lemma.

Putnam C.I. 6927**Reg. No. 152**

Description.—Juvenile growth upright; culm stout, very slightly red; pubescence absent on sheath and leaves; leaves midwide, medium dark green.

Adult plant.—Early; short to midtall (89–114 cm); culms 2–4, few hairs above and below nodes; plant color medium dark green; leaf medium narrow, ligule present, hairs on leaves absent; panicle equilateral, midlong (11–25 cm), and wide (10–16 cm); rachis straight to flexuous; nodes 4–6, false node absent; branches (12–25) medium long, straight to raised or drooping; spikelets 20–50; glumes white, midlong (17–25 mm), fine to medium in texture; florets 2–3; lemma reddish yellow, short to midlong (15–17 mm); nerves 5–7; palea wide, reddish yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel very plump; rachilla segment short and slender, nonpubescent; no hairs on lemma.

Rainbow C.I. 2345**Reg. No. 74**

Description.—Juvenile growth upright; culm slender; pubescence absent on sheath and leaves; leaf medium wide, medium dark green.

Adult plant.—Midlate; midtall to tall (97–127 cm); culms 1–4, few hairs below nodes, numerous above; leaf medium wide, ligule present, usually nonpubescent, sheath and leaf medium dark green; panicle equilateral, midlong (17–30 cm), and wide (10–17 cm); rachis straight, medium slender, slightly flexuous; nodes 5–7, false node absent; branches (17–28) medium long to long, straight to raised; spikelets 30–60; glumes white to yellowish white, midlong (18–23 mm), fine in texture; florets usually 2; lemma yellow, short to midlong (15–19 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent, occasional short basal pubescence present; floret separation by fracture, usually distal; awns absent; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Ransom C.I. 5927**Reg. No. 145**

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Early; short to midtall (76–107 cm); culms 2–4, medium stout, occasional pubescence below nodes, few or none above; plant color medium dark green; leaf midwide, ligule present, pubescence absent on sheath and leaves; panicle equilateral, midlong (15–25 cm), and medium to wide (6–13 cm); rachis midstout, straight to flexuous, often recurved; nodes 5–6, false node absent; branches (15–25) medium to long, straight to drooping; spikelets 17–28; glumes white to reddish, midlong (17–24 mm), fine to medium in texture; florets 2; lemma yellow, short to midlong (14–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, pubescence absent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Richland C.I. 787**Reg. No. 44**

Description.—Juvenile growth upright; culm medium stout, often colored pink; pubescence absent on sheath and leaves; leaf medium wide, medium dark green.

Adult plant.—Early; short (81–102 cm); culms 2–6, medium stout, hairs at nodes absent; plant color medium dark green; leaf medium to narrow, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (15–25 cm), and midwide; rachis slender, slightly flexuous, straight to recurved; nodes 4–6, false node absent; branches (15–20) medium long, straight to raised or straight to drooping; spikelets 15–42; glumes white, midlong (19–22 mm), fine in texture; florets 2–3; lemma yellow to yellowish white, short to midlong (15–18 mm); nerves 5–7; palea medium narrow, yellow; spikelet separation by fracture, basal scar absent, occasional short to medium long basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Rodney C.I. 6661**Reg. No. 166**

Description.—Juvenile growth upright; culm medium stout; slight pubescence on sheath, pubescence absent on leaves; leaf midwide, dark green.

Adult plant.—Midlate; midtall to tall (99–135 cm); culms 1–3, stout, numerous pubescence below nodes, occasional above; plant color dark green; leaf midwide, ligule present, occasional hairs on sheath and leaves; panicle equilateral, midlong (17–24 cm), and wide (13–15 cm); rachis usually straight, somewhat flexuous, occasionally recurved at tip; nodes 6–7, false node absent; branches (21–30) midlong (10–12 cm), straight to raised or straight to drooping; spikelets 30–40; glumes white, midlong (17–22 mm), fine in texture; florets 2–3; lemma white, short to very short (13–15 mm); nerves 7; palea wide, yellowish white to yellow; spikelet separation by fracture, basal scar absent, occasional short basal pubescence present; floret separation by fracture, distal or heterofracture; awns occasional to numerous, straight, subgeniculate to twisted and geniculate; kernel plump to very plump; rachilla segment short to medium long, slender, nonpubescent; no hairs on lemma.

Rusota C.I. 2343**Reg. No. 81**

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midearly; midtall (110–125 cm); culms 2–3, midstout only, nonpubescent at nodes; leaf midwide, medium dark green, ligule present; sheath and leaf nonpubescent; panicle midlong (18–25 cm) and midwide (13–15 cm); rachis midslender, straight to slightly recurved at tip, slightly flexuous; nodes 5–7, false node absent; branches 16–24, long, straight to raised to slightly drooping; spikelets 38–75; glumes white, midlong (19–23 mm), medium to fine in texture; florets 2, lemma white, occasionally grayish at base, midlong (17–18 mm); nerves 7; palea midnarrow, yellowish white, gray flecked; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence absent to an occasional short hair; floret separation by fracture, distal; awns present, occasional to numerous, straight to slightly subgeniculate; kernel midslender; rachilla segment midlong, slender, nonpubescent; no hairs on lemma.

Santee C.I. 7454**Reg. No. 193**

Description.—Juvenile growth semidecumbent; culms slender, slightly pink; pubescence on sheath and leaves absent; leaf medium wide, medium dark green.

Adult plant.—Late; very tall (152–157 cm); culms 1–2, stout, pubescence at nodes absent; leaf medium wide, attitude medium raised, ligule present, pubescence on leaves absent; panicle equilateral, long (25–27 cm); rachis very slightly recurved; nodes 6–8, false node absent; branches (20–26) long (10–13 cm), raised to straight; spikelets 30–48; glumes very light reddish yellow, midlong (17–18 mm), fine in texture; florets 2; lemma white, short (14–15 mm); nerves 7; palea wide, white; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by fracture, distal or heterofracture; awns numerous, subgeniculate, twisted and geniculate; kernel plump; rachilla segment long (2.5–2.75 mm), and very slender, nonpubescent; no hairs on lemma.

Sauk C.I. 5946**Reg. No. 191**

Description.—Juvenile growth very upright; culm medium stout, slightly red; pubescence absent on leaves and sheath; leaf medium wide, medium dark green.

Adult plant.—Midseason; midtall to tall (104–132 cm); culms 1–4, midstout, occasional to numerous hairs above nodes, occasional below; plant color medium dark green; leaf medium wide, ligule present, hairs on leaves absent; panicle equilateral, midlong (15–25 cm), and medium to wide; rachis straight to flexuous; nodes 5–6, false node absent; branches (14–25) medium to long, straight to raised; spikelets 20–40; glumes white, midlong (18–22 mm), fine to medium in texture; florets 2–3; lemma yellow to reddish yellow, short to midlong (15–18 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar usually absent, occasional short basal pubescence; floret separation by heterofracture; awns numerous, straight, subgeniculate to twisted and geniculate; kernel midplump; rachilla segment medium long and medium slender, nonpubescent; no hairs on lemma.

Scottish Chief C.I. 1699**Reg. No. 29**

Description.—Juvenile growth upright; culm medium stout; few hairs on sheath, hairs absent on leaves; leaf medium wide, medium dark green.

Adult plant.—Midseason; midtall to tall (104–124 cm); culms 2–4, stout, few to numerous pubescence above and below nodes; plant color medium dark green; leaf midwide, ligule present, no pubescence on sheath or leaves; panicle equilateral, midlong (15–25 cm), and wide; rachis straight to flexuous; nodes 5–6, false node absent; branches (15–20) long, straight to raised, occasionally drooping; spikelets 25–55; glumes midlong (21–23 mm), white, fine in texture; florets 2–3; lemma white, midlong to long (17–20 mm); nerves 7; palea midwide, white to yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment medium long and slender, occasional medium long pubescence present; no hairs on lemma.

Shelby C.I. 4372

Reg. No. 118

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf medium wide, medium dark green.

Adult plant.—Midearly; midtall (97–127 cm); culms 2–4, medium stout, pubescence absent above and below nodes; plant color medium dark green; leaf medium narrow, ligule present, pubescence absent on sheath and leaf margins; panicle equilateral, midlong (15–25 cm), and medium wide; rachis midstout, straight to flexuous; nodes 5–7, false node absent; branches (11–20) short to medium long, raised to straight; spikelets 17–30; glumes reddish, midlong (19–24 mm), coarse in texture; florets 2–3; lemma reddish white to reddish yellow, medium short (15–16 mm); nerves 5–7; palea midwide, yellow to gray flecked; spikelet separation by fracture, basal scar absent to obscure, occasional medium to long basal pubescence present; floret separation by fracture, distal or heterofracture; awns occasional, subgeniculate to twisted, geniculate; kernel midplump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Silvermine C.I. 1013

Reg. No. 30

Description.—Juvenile growth upright; culm stout, slight or no pubescence on sheath or leaves; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall (107–129 cm); culms 2–5, stout, pubescence sparse on sheath and above and below nodes; leaf

midwide, medium dark green, ligule present, hairs on margins absent; panicle equilateral, midlong (15–25 cm), and midwide; rachis straight to slightly flexuous and slightly recurved at tip; nodes 5–7, false node absent; branches (16–26) medium long, straight to raised; spikelets 31–70; glumes white, midlong (20–25 mm), fine to medium coarse in texture; florets 2–3; lemma white to slightly reddish, midlong (15–18 mm); nerves 5–7; palea midwide, white to slightly gray; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence absent to occasional, medium long; floret separation by fracture, distal or heterofracture; awns few to numerous, usually straight; kernel midplump to plump; rachilla segment medium long and medium slender, nonpubescent; no hairs on lemma.

Simcoe C.I. 6767

Reg. No. 167

Description.—Juvenile growth upright; culm stout, light pink; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall to tall (114–122 cm); culms 1–4, stout, nonpubescent at nodes; plant color medium dark green; leaf midwide, ligule present, pubescence absent on sheath and leaves; panicle equilateral, midlong (15–25 cm), and wide (10–13 cm); rachis straight to flexuous; nodes 4–7, false node absent; branches (12–22) medium long, straight to raised; spikelets 18–48; glumes white, midlong (18–22 mm), fine in texture; florets 2–3; lemma white, midlong to long (16–19 mm); nerves 5–7; palea midwide, yellow to yellowish white; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by fracture, distal to heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Spooner C.I. 3165

Reg. No. 82

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf usually nonpubescent.

Adult plant.—Midseason; midtall (110–145 cm); culms 2–4, midstout, pubescence at nodes occasional to few above and below; leaf midwide, medium dark green, ligule present, sheath and leaf usually nonpubescent; panicle equilateral, midlong (18–28 mm), and midwide (10–13 cm); rachis straight to recurved at tip; nodes 6–7, false node absent; branches 18–33, medium to long, straight to

slightly drooping; spikelets 35–70; glumes white, midlong (20–22 mm), medium fine in texture; florets 2–3, lemma white to yellowish white, midlong (16–18 mm); nerves 7; palea light yellow to grayish yellow; spikelet separation by fracture; basal scar absent to obscure; basal pubescence absent to occasional, short to midlong; floret separation by fracture, usually distal; awns few to occasional, straight; kernel midplump; rachilla segment medium to long, slender to midwide; rachilla hairs occasional to few, short; no hairs on lemma.

Standwell C.I. 1975

Reg. No. 60

Description.—Juvenile growth upright; culm midstout; pubescence slight on sheath and leaf; leaves midwide, medium dark green.

Adult plant.—Midseason; midtall (108–135 cm); culms 1–3, midstout; hairs at nodes, few to numerous above, occasional below; leaf midwide, ligule present, medium dark green; occasional hairs on sheath and leaf margins; panicle equilateral, midlong (17–30 cm), and wide (10–22 cm); rachis straight to recurved; nodes 6–7, false node absent; branches 20–29, midlong to long, straight to raised to drooping; spikelets 34–75, glumes white, midlong (19–21 mm), fine in texture; florets 2, lemma white to yellowish white, midlong (16–18 mm); nerves 7, obscure; palea white to yellowish white; spikelet separation by fracture, usually distal, occasionally by heterofracture; basal scar absent to occasionally obscure; basal pubescence occasional, short to midlong; floret separation by fracture, distal; awns occasional to numerous; straight to subgeniculate; kernel slender to midwide; rachilla segment midlong, slender to midwide; pubescence occasional, hair short to midlong; no hairs on lemma.

State Pride C.I. 1154

Reg. No. 45

Description.—Juvenile growth upright; culm medium stout, often colored slightly red; pubescence absent on sheath and leaves; leaf narrow, medium dark green.

Adult plant.—Early; midtall (107–109 cm); culms 2–4, midstout, pubescence absent at nodes; plant color medium dark green; leaf midwide, ligule present, slight or no pubescence on sheath or leaf margins; panicle equilateral, midlong (13–25 cm), and medium wide; rachis straight, medium slender, recurved; nodes 5–6, false node absent; branches (12–24) short to long, straight to raised,

often drooping; spikelets 20–42; glumes white, midlong (19–21 mm), fine in texture; florets 2; lemma yellow, short to midlong (15–17 mm); nerves 7; palea medium narrow, yellow; spikelet separation by fracture, basal scar absent, occasional medium long basal pubescence present; floret separation by fracture, usually distal; awns occasional straight, subgeniculate or twisted, geniculate; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Swedish Select C.I. 134

Reg. No. 31

Description.—Juvenile growth upright; culm stout, leaves midwide, dark green; sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall (113–135 cm); culms 2–4, stout, only occasional pubescence at nodes; leaves midwide, dark green, ligule present, sheath and leaf nonpubescent; panicle equilateral, midlong (20–26 cm), and midwide; rachis straight to only slightly flexuous; nodes 5–6, false node absent; branches (19–33) midlong, usually raised to straight; spikelets 34–54; glumes white, midlong (20–25 mm), fine to medium in texture; florets 2, occasionally 3; lemma white, sometimes slightly yellow near base, midlong (16–17 mm); nerves 7, obscure; palea midwide to wide, white; spikelet separation by fracture; basal scar absent, an occasional long basal hair present; floret separation by fracture, distal; awns numerous, subgeniculate to twisted, geniculate; kernel plump; rachilla segment short to midlong and midwide, nonpubescent; no hairs on back of lemma.

Tama C.I. 3502

Reg. No. 99

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Early; midtall (100–110 cm); culms 2–4, midstout, no pubescence at nodes; leaf midwide, ligule present, medium dark green, sheath and leaf nonpubescent; panicle equilateral, midlong (12–16 cm), and midwide; rachis straight to recurved at tip; nodes 4–6, false node absent; branches (14–19) midlong, straight to raised; spikelets 18–28; glumes white, midlong (19–22 mm), fine to medium coarse in texture; lemma yellow, midlong (16–18 mm); nerves 7, obscure; palea yellow, midwide; spikelet separation by fracture, basal scar absent, basal pubescence occasional, short to midlong; floret separation by fracture, distal to occasionally heterofracture; awns occasional, straight to subgeniculate; kernel midplump;

rachilla segment midlong and slender with occasional midlong hair present; no hairs on back of lemma.

Tioga C.I. 7524

Reg. No. 197

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Late; midtall to tall (109–147 cm); culms 1–3, medium slender, numerous pubescence above nodes, few below; plant color medium dark green; leaf midwide, ligule present, few hairs on leaf margins; panicle equilateral, midlong (17–20 cm), and medium wide; rachis straight to flexuous; nodes 5–7, false node absent; branches (15–23) long (7–8 cm), straight, raised to drooping; spikelets 24–38; glumes white with pinkish tinge to very light gray, midlong (23–25 mm), medium fine to coarse in texture; florets 2–3; lemma white to yellowish white, somewhat glaucous, short to medium long (15–18 mm); nerves 5–7; palea wide, white to gray flecked; spikelet separation by fracture, basal scar absent to obscure, occasional to few, medium short basal pubescence present; floret separation by heterofracture or fracture, distal; awns very occasional to few, very short, straight or subgeniculate; kernel slender to very plump; rachilla segment short to midlong (1.5–2 mm), slender to medium wide, nonpubescent; no hairs on lemma.

Tobolsk C.I. 1709

Reg. No. 32

Description.—Juvenile growth upright; culm medium stout; pubescence absent on leaves and sheath; leaf narrow, medium dark green.

Adult plant.—Midseason; midtall to tall (99–140 cm); culms 2–4, very slender, few to numerous hairs above and below nodes; plant color medium dark green; leaf medium narrow, ligule present, hairs on leaves absent; panicle equilateral, midlong (17–25 cm), and wide (10–17 cm); rachis straight to slightly flexuous; nodes 5–7, false node absent; branches (19–35) long, slender, straight to drooping; spikelets 37–60; glumes white, midlong (17–21 mm), fine in texture; florets 2; lemma yellowish white, midlong (15–17 mm); nerves 5–7, obscure; palea narrow, yellowish white; spikelet separation by fracture, basal scar absent, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight to subgeniculate; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Tonka C.I. 7192**Reg. No. 172**

Description.—Juvenile growth upright; culm slender, often colored red; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Early; short (76–102 cm); culms 1–5, slight or no pubescence on sheath or nodes; flag leaf often erect, blade medium narrow, ligule present, pubescence absent, leaves medium dark green; panicle equilateral, midlong (11–25 cm), and medium wide; rachis straight; nodes 4–6, false node absent; branches (10–18) short to medium long, straight to raised; spikelets 13–25; glumes light red or pink, midlong (18–22 mm), medium fine in texture; florets 2; lemma reddish yellow, short to midlong (16–17 mm); nerves 7; palea midwide, reddish yellow; spikelet separation by fracture, basal scar absent, occasional long basal pubescence present; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment medium to long and slender, nonpubescent; no hairs on lemma.

Trio C.I. 7698**Reg. No. 252**

Description.—Juvenile growth upright; culm midstout; slight or no pubescence on sheath or leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall (105–115 cm); culms 3–5, midstout, nodal pubescence absent; leaf midwide, ligule present, medium dark green, no pubescence on sheath or leaf; panicle equilateral, midlong (16–20 cm), midwide; rachis straight to slightly flexuous; nodes 6–7, false node absent; branches 16–20, midlong, usually raised to straight; spikelets 17–20; glumes reddish yellow, midlong (24–25 mm), medium fine in texture; florets 2–3; lemma yellow to reddish yellow, midlong (17–18 mm); nerves 7; palea midwide, light reddish yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence usually absent, but occasional few very short; floret separation by fracture, distal; awns few to numerous, straight to subgeniculate; kernel plump; rachilla segment midlong (2–2.25 mm), medium slender, nonpubescent; no hairs on back of lemma.

Upright C.I. 2142**Reg. No. 61**

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall to tall (110–140 cm); culms 2–3, midstout, nonpubescent at nodes; leaf midwide, medium to dark green; ligule present; sheath and leaf slight to nonpubescent; panicle equilateral, midlong (21–28 cm), and midwide (11–12 cm); rachis straight, slender, slightly flexuous, recurved at tip; nodes 6–7, false node absent; branches 21–28, long, straight to raised; spikelets 40–65; glumes white, midlong (23–26 mm), medium to fine in texture; florets 2; lemma white to yellowish white; midlong (17–19 mm); nerves 7, obscure; palea midwide, white; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence absent; floret separation by fracture, distal, awns numerous, straight to subgeniculate; rachilla segment midlong (2.5–3.0 mm), midwide, nonpubescent, no hairs on lemma.

Uton C.I. 3141

Reg. No. 97

Description.—Juvenile growth upright; culm midstout to stout; leaf midwide, medium dark green; sheath and leaf margin slightly pubescent.

Adult plant.—Midseason; midtall (110–135 cm); culms 2–3, midstout, nodal pubescence occasional to numerous both above and below nodes; leaf midwide, medium dark green; sheath and leaf somewhat pubescent; panicle equilateral, midlong (20–26 cm), and midwide (15–18 cm); rachis straight to flexuous; nodes 5–6, false node absent; branches 15–25, long, straight to drooping; spikelets 25–40; glumes white to reddish white, midlong (22–25 mm), medium fine in texture; florets 2–3, lemma usually white, but may be light reddish yellow at base; midlong (19–22 mm); nerves 7; palea midwide, white to reddish white; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence present, occasional to numerous, short to midlong; floret separation by fracture, distal to heterofracture; awns occasional to numerous, straight, subgeniculate to twisted and geniculate; kernel midplump; rachilla segment midlong to long, midwide to slender, nonpubescent; no hairs on lemma.

Vicland C.I. 3611

Reg. No. 93

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Early; midtall (110–115 cm); culms 2–4, midstout, nonpubescent at nodes; leaf midwide, medium dark green, ligule

present, sheath and leaf nonpubescent; panicle equilateral, midlong (14–20 cm), and midwide (7–10 cm); rachis straight; nodes 4–6, false node absent; branches (14–20) short to midlong, straight to raised; spikelets (16–33); glumes white to light reddish yellow, midlong (18–22 mm), medium to fine in texture; florets 2–3; lemma yellow, medium long (16–17 mm); nerves 7; palea midwide, reddish yellow; spikelet separation by fracture; basal scar absent to very obscure, basal pubescence occasional, midlong; floret separation by fracture, distal to heterofracture; awns occasional, straight to subgeniculate; kernel midplump; rachilla segment midlong, medium slender, nonpubescent; no hairs on lemma.

Victor C.I. 803**Reg. No. 33**

Description.—Juvenile growth intermediate; culm very stout; pubescence absent on culm and sheath, few hairs on base and margins of upper leaf; leaf narrow, dark green.

Adult plant.—Midseason; midtall to very tall (109–152 cm); culms 2–4, stout, no hairs above and below nodes; leaf midwide, ligule present, occasional hairs on leaf margins; plant color dark green; panicle equilateral, long (24–30 cm), very wide, often not fully exerted; rachis usually flexuous, recurved; nodes 6–8, false node absent; branches (18–29) very long, drooping; spikelets 40–67; glumes white, long (24–28 mm), coarse in texture; florets 2; lemma black with gray tip, midlong (18–20 mm); nerves 7, obscure; palea midwide, black; spikelet separation by fracture, basal scar absent to very obscure, occasional, short to medium basal pubescence present; floret separation by fracture, distal; awns numerous twisted, geniculate; kernels slender to medium plump; rachilla segment long and slender, occasional short hairs present; no hairs on lemma.

Victory C.I. 560**Reg. No. 232**

Description.—Juvenile growth upright; culm medium to stout; few hairs on sheath; pubescence absent on leaves; leaf medium wide, medium dark green.

Adult plant.—Midseason; midtall to tall (104–137 cm); culms 2–3, stout, few hairs above and below nodes; leaf midwide, ligule present, medium dark green, hairs on sheath and leaves absent; panicle equilateral, midlong (15–23 cm), and wide (9–15 cm); rachis midstout, straight; nodes 5–7, false node absent; branches 17–24, medium long, straight to raised; spikelets 22–62; glumes white,

midlong (18–22 mm), fine in texture; florets 2–3; lemma white, short to midlong (15–17 mm); nerves 7, obscure; palea wide, yellowish white; spikelet separation by fracture, basal scar absent, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel plump; rachilla segment short, medium to wide, nonpubescent; no hairs on lemma.

Waubay C.I. 5440**Reg. No. 156**

Description.—Juvenile growth upright; culm medium stout, often colored red; pubescence absent on leaves and sheath; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall (74–117 cm); culms 2–5, stout, few hairs below nodes; plant color medium dark green; leaf midwide, erect, ligule present, hairs on leaves absent; panicle equilateral, midlong (15–25 cm), and midwide; rachis straight to flexuous; nodes 4–6, false node absent; branches (10–20) short to midlong, stiff, straight to raised; spikelets 11–30; glumes reddish white, midlong (18–25 mm), fine to medium in texture; florets 2–3; lemma white to yellow, gray flecked, short to midlong (15–18 mm); nerves 7; palea wide, grayish yellow; spikelet separation by fracture, basal scar absent to obscure, occasional medium to long basal pubescence present; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short to medium long, slender to medium wide, occasional medium to long rachilla hairs present; no hairs on lemma.

Wayne C.I. 2567**Reg. No. 77**

Description.—Juvenile growth intermediate; culm stout; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall (104–127 cm); culms 1–3, stout, few hairs above nodes, none below; plant color medium dark green; leaf midwide, ligule present, hairs on leaves absent; panicle equilateral, midlong (15–22 cm), and midwide; rachis straight to flexuous, occasionally recurved at tip; nodes 6–7, false node absent; branches (17–26) medium long, usually raised; spikelets 34–75; glumes white, midlong (17–21 mm), fine in texture; florets 2; lemma white to yellowish white, short to midlong (15–17 mm); nerves 5–7; palea midwide, yellowish white to yellow; spikelet separation by fracture, basal scar absent to obscure, occasional

short basal pubescence present; floret separation by fracture, distal; awns numerous, subgeniculate to twisted, geniculate; kernel midplump to plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

White Cross C.I. 2026

Reg. No. 49

Description.—Juvenile growth upright; culm medium slender; pubescence absent on culms, sheath, and leaves; leaf medium narrow, medium dark green.

Adult plant.—Midseason; midtall to tall (104–130 cm); culms 1–3, slender, numerous pubescence above and below nodes; plant color medium dark green; leaf midwide, ligule present, pubescence absent on sheath and leaves; panicle equilateral, long (18–24 cm), and medium wide; rachis midslender, recurved; nodes 5–7, false node absent; branches (16–26) long, usually drooping, occasionally straight to raised; spikelets 29–56; glumes white, midlong (18–23 mm), fine in texture; florets 2; lemma white, midlong (17–19 mm); nerves 5–7; palea midwide, white; spikelet separation by fracture, basal scar obscure, numerous short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment medium to long and slender, occasional short rachilla hairs present; no hairs on lemma.

Winema C.I. 4373

Reg. No. 146

Description.—Juvenile growth intermediate; culm medium stout; pubescence absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Midearly; short to midtall (81–107 cm); culms 2–4, medium stout, pubescence absent at nodes and on sheath; plant color medium dark green; leaf midnarrow, ligule present, nonpubescent; panicle equilateral, midlong (12–25 cm), and wide; rachis straight, slightly flexuous, recurved; nodes 4–5, false node absent; branches (12–25) medium to long, straight to raised; spikelets 10–40; glumes white, midlong (18–25 mm), fine in texture; florets 2–3; lemma yellow, midlong (16–18 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, occasional medium long basal pubescence present; floret separation by fracture, distal to heterofracture; awns occasional to numerous, subgeniculate to twisted, geniculate; kernel medium plump; rachilla segment short to medium long and slender, occasional short rachilla hairs present; no hairs on lemma.

Wisconsin Wonder C.I. 1645**(Wisconsin No. 1)****Reg. No. 62**

Description.—Juvenile growth upright; culm midstout; leaves midwide, medium dark green; sheath and leaves nonpubescent.

Adult plant.—Midearly; midtall (119–130 cm); culms 2–3, midstout, nodes and leaf nonpubescent; leaf midwide, ligule present, medium dark green; panicle equilateral, midlong (18–25 cm), and midwide; rachis straight; nodes 5–6, false node absent; branches (19–28) midlong and straight to slightly drooping; spikelets 31–65; glumes white, midlong (23–25 mm), medium to fine in texture; florets 2; lemma white to yellowish white, midlong (18–20 mm); nerves 7, obscure; palea midwide, white; spikelet separation by fracture; basal scar absent to very obscure, pubescence occasional, midlong to short; floret separation by fracture, distal; awns absent to occasional, straight to subgeniculate; kernel midplump to slender; rachilla segment short to midlong, medium to slender, pubescence absent to occasional, short to midlong; no hairs on back of lemma.

Wolverine C.I. 1591**Reg. No. 70**

Description.—Juvenile growth upright; culms midstout; leaf midwide, medium dark green, pubescence absent on sheath and leaf.

Adult plant.—Midseason; midtall (108–135 cm); culms 2–4; pubescence absent to occasional, above and sometimes below nodes; plant color medium dark green; leaf midwide, ligule present, nonpubescent; panicle equilateral, midlong (15–22 cm), and medium to wide (10–13 cm); rachis stout, straight to recurved; nodes 5–6, false node absent; branches 18–25, medium to long, straight to raised; spikelets 39–55; glumes white, midlong (17–20 mm), fine in texture; florets 2, occasionally 3; lemma white, medium short (15–16 mm); nerves 7; palea midwide, white to yellowish white; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence absent to occasional, short, floret separation by fracture, distal; awns occasional, straight; kernel midwide; rachilla segment midlong to long, midwide to slender, nonpubescent; no hairs on lemma.

Worthy C.I. 1590**Reg. No. 71**

Description.—Juvenile growth upright; culm midstout; leaf midwide, pubescence absent on sheath and leaf margin; plant medium dark green.

Adult plant.—Midseason; midtall (108–135 cm); culms 2–4, pubescence absent to few above and below node; plant color medium dark green; leaf midwide, ligule present, pubescence absent to occasional on sheath and leaf margin; panicle equilateral, midlong (20–25 cm), and midwide (13–19 cm); rachis slender, straight to slightly flexuous and slightly recurved; nodes 5–7, false node absent; branches 19–27, midlong, straight to raised; spikelets 35–58; glumes white, midlong (20–21 mm), fine in texture; florets 2, occasionally 3; lemma white, medium short (15–16 mm); nerves 7; palea midwide, usually yellow; spikelet separation by fracture; basal scar absent; basal hairs occasional, short; floret separation by fracture, distal; awns absent to occasional, straight; kernel plump; rachilla segment midlong, slender to midwide, nonpubescent; no hairs on lemma.

Wyndmere C.I. 7552**Reg. No. 217**

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf medium wide, medium dark green, sometimes has a pinkish tinge.

Adult plant.—Early; tall (127–130 cm); culms 1–2, medium stout, pubescence absent on sheath and at nodes; leaf medium wide, upright in attitude, ligule present, pubescence absent, medium dark green; panicle equilateral, long (22–24 cm); rachis slightly flexuous; nodes 9–10, false node absent; branches (23–27) long, straight to slightly raised; spikelets 40–44; glumes very light reddish, midlong (20–22 mm), fine in texture; florets 2; lemma very light reddish, short (15–16 mm); nerves 7, very obscure; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by fracture, distal to heterofracture; awns numerous, subgeniculate to twisted, geniculate; kernel medium slender; rachilla segment long (2.25–2.5 mm) and very slender, nonpubescent; no hairs on lemma.

Zephyr C.I. 4800**Reg. No. 19**

Description.—Juvenile growth upright; culm stout, often slightly pink; pubescence absent on sheath and leaves; leaf narrow to medium wide, medium dark green.

Adult plant.—Midseason; midtall (91–119 cm); culms 1–4, stout, pubescence absent on sheath and at nodes; plant color medium dark green; leaf medium to narrow, ligule present, nonpubescent; panicle equilateral, midlong (13–25 cm), and midwide; rachis stout, straight to slightly flexuous; nodes 4–5, false node absent; branches (12–20) short to medium long, usually raised in attitude; spikelets 14–40; glumes white, midlong (22–25 mm), coarse in texture; florets 2–3; lemma white, midlong to long (16–20 mm); nerves 5–7, prominent; palea midwide, white to grayish white; spikelet separation by fracture, basal scar obscure, occasional short basal pubescence present; floret separation by heterofracture; awns very numerous, twisted, geniculate; kernel plump; rachilla segment short to medium long and wide, nonpubescent; no hairs on lemma.

Not Registered by the American Society of Agronomy**Abda C.I. 7145**

Description.—Juvenile growth upright; culm medium stout; occasional hairs on sheath and leaves; plant color green.

Adult plant.—Late; tall (125–130 cm); culms 2–3, medium slender, occasional hairs above and below nodes; leaf medium wide, ligule present, medium dark green, hairs on sheath and leaves occasional or absent; panicle equilateral, short (8–10 cm); rachis slightly flexuous; nodes 5–7, false node absent; branches (21–24) straight to raised, medium long (9–10 cm); spikelets 26–34; glumes white, midlong (22–23 mm), fine to medium in texture; florets 2; lemma very light yellow, midlong (16–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional medium long basal hair present; floret separation, by fracture, distal to heterofracture; awns absent; kernel midplump; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Abegweit C.I. 4970
C.A.N. 693

Description.—Juvenile growth upright; culm stout, slightly pink; occasional hairs on sheath; leaves midwide, no pubescence on leaf margins, medium dark green.

Adult plant.—Early; midtall (99–119 cm); culms 1–4, stout, occasional hairs above and below nodes; leaf medium wide, ligule present, medium dark green, no hairs on sheath or leaves; panicle equilateral, short (13–20 cm) and medium wide; rachis straight to flexuous; nodes 5–6, false node absent; branches (13–23) medium long, straight to raised; spikelets 21–37; glumes white, midlong (18–21 mm), fine in texture; florets 2–3; lemma white, medium short (15–18 mm); nerves 7; palea wide, white; spikelet separation by fracture, basal scar absent, basal hair occasional, short; floret separation by fracture, distal; awns occasional to few, straight, subgeniculate to twisted, geniculate; kernel plump; rachilla segment short to medium long, usually slender to medium wide, pubescence absent; no hairs on lemma.

Ada C.I. 7144

Description.—Juvenile growth upright; culm medium stout; few hairs on sheath or leaves; leaves midwide to wide, medium dark green.

Adult plant.—Midearly; very tall (160–170 cm); culms 3–4, medium stout, no hairs at nodes; leaf medium wide, ligule present, medium dark green, few hairs on sheath or leaf margins; panicle equilateral, short (10–12 cm) and wide; rachis flexuous and recurved; nodes 5–7, false node absent; branches 20–22, long (22–25 cm), drooping; spikelets 36–68; glumes white, midlong (21–22 mm), fine in texture; florets 2; lemma light red, midlong (14–16 mm); nerves 7; palea midwide, yellow to very light red; spikelet separation by fracture, basal scar absent to obscure, occasional to few long basal hairs present; floret separation by heterofracture; awns few, subgeniculate; kernel midplump; rachilla segment long (2–2.5 mm), very slender, nonpubescent; no hairs on lemma.

Advance C.I. 3845

Description.—Juvenile growth upright; culm stout, slightly red; no hairs on sheath or leaf margins; leaves midwide, dark green.

Adult plant.—Midearly; midtall (99–122 cm); culms 1–5, stout, few to numerous hairs above and below nodes; leaf narrow to medium wide, ligule present, color dark green, no hairs on sheath or leaves; panicle equilateral, short to midlong (11–20 cm) and medium wide; rachis straight to slightly flexuous; nodes 4–6, false node absent; branches (11–25) short to medium long, raised to straight; spikelets 15–27; glumes light red or red, midlong (17–22 mm), coarse in texture; florets 2; lemma yellow, medium long (15–19 mm); nerves 5–7; palea midwide, grayish yellow to yellowish red; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation by heterofracture; awns numerous, straight, subgeniculate or twisted and geniculate; kernel plump; rachilla segment medium long, slender to medium wide, nonpubescent; no hairs on lemma.

Alaska C.I. 1710

Description.—Juvenile growth upright; culm medium to stout; slight pubescence on sheath and leaf.

Adult plant.—Midseason; midtall (105–130 cm); culms 2–3, midstout; few hairs above and below nodes; leaf midwide, ligule present; medium dark green; occasional hair on sheath and leaf margin; panicle equilateral, midlong (15–22 cm) and wide (9–15 cm); rachis medium stout, straight to slightly flexuous; nodes 6–7, false node absent; branches 14–16, midlong, straight to drooping; spikelets 28–42, glumes white, midlong (22–25 mm), medium in texture; florets usually 2; lemma white to darker at base, midlong (17–20 mm); nerves 7, obscure; palea midwide, white to yellowish gray; spikelet separation by fracture, basal scar absent, occasional midlong pubescence present; floret separation by fracture, distal; awns few to numerous, straight to subgeniculate; kernel midplump to plump; rachilla segment midlong (2.5–3.0 mm), midstout, occasional midlong hair present; no hairs on lemma.

Archangel C.I. 1947

Description.—Juvenile growth upright; culm medium stout; slight pubescence on sheath; leaves midwide, medium light green, nonpubescent.

Adult plant.—Midseason; midtall (119–128 cm); culms 1–4, slender, pubescence few to very numerous above and below nodes; leaf midwide, ligule present, medium light green, hairs on sheath and leaves absent; panicle equilateral, midlong (18–22 cm), widespread (7–8 cm); rachis straight to slightly flexuous and recurved; nodes 6–8, false node absent; branches (16–25), long (12–15 cm), straight

to drooping; spikelets 25–51; glumes white, long (24–25 mm), medium fine in texture; florets 2–3; lemma very light yellow, midlong (16–19 mm); nerves 5–7, very obscure; palea narrow, white to yellow; spikelet separation by fracture, basal scar absent to obscure, occasional to numerous, short basal hairs present; floret separation by fracture, distal; awns numerous, straight, subgeniculate to twisted, geniculate; kernel midslender; rachilla segment midlong, slender, nonpubescent; no hairs on lemma.

Basin C.I. 5346

Description.—Juvenile growth intermediate; culm stout; hairs absent on sheath and leaves; leaves wide, medium dark green.

Adult plant.—Late; midtall (95–106 cm); culms stout, 2–4, no hairs above or below nodes; leaf midwide, ligule present, no hairs on sheath or leaves; panicle equilateral, medium long (17–20 cm), and wide; rachis straight to flexuous; nodes 5–6, false node absent; branches (14–21) medium long (7–8 cm), straight to raised; spikelets 22–28; glumes white, midlong (18–19 mm), fine in texture; florets 2–3; lemma white to yellow, gray flecked, short (13–15 mm); nerves 7, obscure; palea very wide, yellow; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, short; floret separation by fracture, distal or heterofracture; awns occasional, straight; kernel very plump; rachilla segment medium long to long (1.5–2.25 mm), slender to wide, nonpubescent; no hairs on lemma.

Beacon C.I. 4608

C.A.N. 696

Description.—Juvenile growth very upright; culm stout; hairs on sheath and leaf margins absent; leaves medium narrow, medium dark green.

Adult plant.—Midlate; midtall (97–124 cm); culms 1–4, stout, hairs at nodes absent; leaf midwide, ligule present, medium dark green, pubescence on sheath and leaves absent; panicle equilateral, medium long (14–23 cm) and medium wide; rachis straight to flexuous; nodes 4–7, false node absent; branches (19–29) medium to long, straight to raised; spikelets 15–45; glumes white, medium long (17–21 mm), fine in texture; florets 2–3; lemma white, short to midlong (14–16 mm); nerves 5–7; palea midwide, grayish yellow to yellow; spikelet separation by fracture, basal scar absent to obscure, occasional to few short to midlong basal hairs present; floret separation by fracture, usually distal, occasionally by heterofrac-

ture; awns occasional, straight; kernel plump; rachilla segment short to medium, slender to midwide, nonpubescent; no hairs on lemma.

Beaver C.I. 4521

C.A.N. 672

Description.—Juvenile growth upright; culm stout; no hairs on sheath; leaves midwide, pubescence absent, medium light green.

Adult plant.—Midlate; midtall (99–130 cm); culms 1–4, stout, hairs at nodes absent to few above, more numerous below; leaf midwide, ligule present, medium light green, few or no hairs on sheath or leaves; panicle equilateral, midlong (14–25 cm), midwide; rachis straight to flexuous, often recurved at tip; nodes 4–6, false node absent; branches (12–25) medium to long, straight, raised to drooping; spikelets 14–36; glumes white, long (19–24 mm), fine to medium in texture; florets 2–3; lemma white, medium long (17–18 mm); nerves 7; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent to obscure, pubescence occasional to few, very short; floret separation by fracture, distal; awns numerous, subgeniculate, twisted and geniculate; kernel midplump; rachilla segment medium to long, slender to medium wide, occasional to few short hairs present; no hairs on lemma.

Bondvic C.I. 5401

Description.—Juvenile growth upright; culm stout, slightly red in color; leaf medium wide, hairs absent on sheath and leaf margins, medium dark green.

Adult plant.—Midearly; midtall (99–117 cm); culms 1–5, stout, hairs at nodes absent; leaf medium wide, ligule present, dark green, no hairs on leaf margins; panicle equilateral, medium long (15–25 cm) and medium wide; rachis straight to flexuous; nodes 4–6, false node absent; branches (10–18) short to medium long, raised; spikelets 13–25; glumes white to pinkish white, midlong (19–22 mm), medium coarse in texture; florets 2; lemma gray, short (14–15 mm); nerves 5–7, prominent; palea wide, gray; spikelet separation by fracture, basal scar absent to obscure, occasional long basal hairs present; floret separation by fracture, usually distal or heterofracture; awns numerous, twisted and geniculate; kernel very plump; rachilla segment short and wide, nonpubescent; no hairs on lemma.

Camas C.I. 2965

Description.—Juvenile growth upright; culm stout; pubescence few to absent on sheath and leaves; leaf midwide, medium dark green.

Adult plant.—Midseason; tall (114–150 cm); culm stout, few to numerous hairs above and below nodes; leaf midwide to wide, medium dark green, ligule present, occasional hairs on sheath and leaf margin; panicle equilateral, medium long (15–25 cm), often widespread; rachis straight to recurved; nodes 5–7, false node absent; branches 20 to more than 30, long, stout; spikelets 20–70; glumes white, midlong (21–29 mm), medium to coarse in texture; florets 2–3; lemma white to reddish white, medium long (17–20 mm); nerves 7; palea midwide, usually white, may be slightly gray; spikelet separation usually by fracture; basal scar absent to obscure, pubescence sparse and short; floret separation by hetero-fracture or fracture, distal; awns few, straight to subgeniculate; kernel midplump; rachilla segment short to medium long, medium wide to wide, nonpubescent; no hairs on lemma.

Canuck C.I. 4024

C.A.N. 747

Description.—Juvenile growth upright; culm medium stout, few hairs on sheath, leaf medium dark green, narrow, midlong, few hairs on margins.

Adult plant.—Medium late; midtall (124–130 cm); culms 2–3, medium stout, few hairs below and numerous above nodes; leaf medium narrow, ligule present, medium dark green, few hairs on leaf margin; panicle equilateral, medium long (16–17 cm), and wide (10–14 cm); rachis straight to slightly flexuous; nodes 5–6, false node absent; branches (20–24), long (8–10 cm), straight to slightly raised; spikelets 27–35; glumes midlong (20–21 mm), slightly reddish, fine in texture; florets 2–3; lemma light yellow, short (15–16 mm); nerves 7, very obscure; palea midwide, yellow; spikelet separation by fracture, basal scar absent, occasional medium long basal hairs present; floret separation by fracture, distal; awns absent; kernel medium slender; rachilla segment short, slender, nonpubescent; no hairs on lemma.

Cartier C.I. 2565

Description.—Juvenile growth upright; culm stout; leaves midwide, medium dark green; no hairs on sheath or leaf.

Adult plant.—Midseason; midtall (105–112 cm); culms 2–3, mid-stout, pubescence on sheath and leaf absent; pubescence on node few above and below; leaf midwide, medium dark green; ligule present, nonpubescent; panicle equilateral, midlong (15–20 cm), and midwide (8–12 cm); rachis straight to slightly flexuous; nodes 5–7, false node absent; branches 19–20, midlong, straight to raised; spikelets 27–44; glumes yellowish white, midlong (20–22 mm), fine in texture; florets 2; lemma white to slightly grayish at base, midlong (16–17 mm); nerves 7; palea midwide, slightly grayish white; spikelet separation by fracture, basal scar absent; basal pubescence absent; floret separation by fracture, distal; awns occasional, straight; kernel plump; rachilla segment midlong and midwide, nonpubescent; no hairs on lemma.

Clintafe C.I. 5869

Description.—Juvenile growth medium upright; culm stout, slightly red, no hairs on sheath; leaves midwide, medium dark green, no hairs on margins.

Adult plant.—Midearly; midtall (102–117 cm); culms 2–4, stout, no hairs above or below nodes; leaf midwide, ligule present, medium dark green, no hairs on sheath or margins; panicle equilateral, midlong (15–20 cm), and wide (8–15 cm); rachis straight; nodes 5–6, false node absent; branches (17–23) midlong, straight to raised; spikelets 25–53; glumes white, midlong (16–20 mm), fine in texture; florets 2; lemma yellow, short (13–15 mm); nerves 7; palea narrow, yellow; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Clintford C.I. 7463

Description.—Juvenile growth intermediate; culm very stout, no hairs on sheath; leaves wide, no hairs on margin, slightly red.

Adult plant.—Early; midtall (99–122 cm); culms 2–3, medium stout, no hairs at nodes; leaf medium wide to wide, attitude decidedly raised, ligule present, medium dark green, no hairs on sheath or margins; panicle equilateral, midlong (17–25 cm), and midwide (5–6 cm); rachis slender, straight to flexuous; nodes 7–8, false node absent; branches (16–20) medium long (8–10 cm), straight to raised; spikelets 31–40; glumes light red, midlong (21–24 mm), fine to medium in texture; florets usually 2; lemma light red, short (13–14 mm); nerves 7; palea wide, red; spikelet separation by

fracture, basal scar absent to very obscure, occasional to few, short to medium long basal hairs; floret separation by fracture, distal; awns occasional, straight to subgeniculate; kernel extremely plump; rachilla segment long (2.5–2.75 mm); very slender, occasional short rachilla hairs; no hairs on lemma.

Clintland 60 C.I. 7234**C.A.N. 891**

Description.—Juvenile growth intermediate; culm stout, no hairs on sheath; leaves midwide, no hairs on leaves, slightly reddish.

Adult plant.—Midearly; medium tall (91–103 cm); culms 2–3, stout, slightly reddish color, no hairs at nodes; leaf midwide, ligule present, medium dark green, hairs on sheath and margins absent; panicle equilateral, medium long (13–17 cm), and wide (10–13 cm); rachis straight to flexuous; nodes 5–6, false node absent; branches (16–17) midlong (5–7 cm), usually raised; spikelets 18–27; glumes yellowish white to pinkish white, midlong (19–21 mm), fine in texture; florets usually 2; lemma yellow, short (15–16 mm); nerves 7; palea wide, yellow or grayish yellow; spikelet separation by fracture, basal scar obscure, nonpubescent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment midlong (1.5–2.5 mm), slender, nonpubescent; no hairs on lemma.

Clintland 64 C.I. 7639

Description.—Juvenile growth intermediate; culm stout, no hairs on sheath; leaf medium narrow, medium dark green, no hairs on leaves.

Adult plant.—Midearly; midtall (116–120 cm); culms 2–3, stout, no hairs above or below nodes; leaf midwide, ligule present, dark green, very slightly glaucous, no hairs on leaves; panicle equilateral, short (15–16 cm), and wide (6–7 cm); rachis straight to slightly flexuous; nodes 5–6, false node absent; branches (19–21) midlong (5–6 cm); spikelets 24–28; glumes yellow tinged with red, short (20–21 mm), medium fine in texture; florets 2–3; lemma yellow, short (15–16 mm); nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar absent to very slight, obscure, nonpubescent; floret separation by heterofracture or fracture, distal; awns absent; kernel very plump; rachilla segment midlong (2–2.25 mm), slender, nonpubescent; no hairs on lemma.

Clinton "11" C.I. 4606

Description.—Juvenile growth upright; culm stout, reddish color, hairs on sheath absent; leaf narrow, medium dark green, no hairs on margins.

Adult plant.—Midearly; midtall (86–107 cm); culms 2–5, no hairs above or below nodes; leaf midwide, ligule present, dark green, no hairs on sheath or leaves; panicle equilateral, midlong (14–17 cm), and midwide (8–11 cm); rachis straight to slightly flexuous; nodes 4–7, false node absent; branches (15–24) straight to raised, medium long; spikelets 21–41; glumes white, midlong (17–22 mm), fine in texture; florets 2–3; lemma yellow, short (14–16 mm); nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment short to medium long, slender to medium wide, nonpubescent; no hairs on lemma.

Clinton 59 C.I. 4259

Description.—Juvenile growth upright; culm stout, reddish color; hairs on sheath absent; leaf midwide, medium dark green, no hairs on margin.

Adult plant.—Midearly; midtall (98–109 cm); culms 1–5, stout, no hairs above or below nodes; leaf midwide, ligule present, medium dark green, no hairs on sheath or leaves; panicle equilateral, midlong (11–17 cm), and midwide (8–10 cm); rachis straight to flexuous; nodes 4–6, false node absent; branches (12–20) short, straight to raised; spikelets 20–30; glumes white to reddish, midlong (18–22 mm), fine in texture; florets 2–3; lemma yellow, short (15–16 mm); nerves 7; palea wide, yellow; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation by heterofracture; awns occasional, straight; kernel plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Cody II or Cody (H.V.R.) C.I. 8276

It is a bulk of reselections from Cody C.I. 3916 having resistance to H.V. *Helminthosporium victoriae*. A footnote on bottom of Cody C.I. 3916 description and on the table of registered spring (tree panicle) oats should suffice.

Cole C.I. 834

Description.—Juvenile growth upright; culm slender, hairs on sheath absent; leaves midwide, medium dark green, no hairs on margins.

Adult plant.—Early; medium short (99–109 cm); culms 2–5, medium slender, slightly pink, hairs at nodes few above, occasional below; leaf medium narrow, ligule present, few or no hairs on sheath or leaves; panicle equilateral, midlong (12–25 cm), often widespreading (6–11 cm); rachis straight to recurved; nodes 4–7, false node absent; branches (12–30) medium long and slender, straight to drooping; spikelets 14–51; glumes white, medium long (19–23 mm), fine in texture; florets 2–3; lemma white, short to midlong (15–18 mm); nerves 5–7; palea narrow, often grayish white; spikelet separation by fracture, basal scar absent to obscure, basal pubescence occasional, short; floret separation by fracture, usually distal; awns usually absent; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Colo C.I. 3972

Description.—Juvenile growth upright; culm medium stout, reddish colored, hairs on sheath absent; leaf midwide, medium dark green, no hairs on margin.

Adult plant.—Midearly; midtall (94–117 cm); culms 2–5, medium stout; numerous hairs below nodes, few above; leaf midwide, ligule present, no hairs on sheath or margins; panicle equilateral, midlong (13–25 cm), and medium wide (8–13 cm); rachis straight to flexuous; nodes 4–7, false node absent; branches (14–22), medium long, straight to raised; spikelets 12–38; glumes white, midlong (20–24 mm), fine in texture; florets 2–3; lemma white, midlong to long (16–21 mm); nerves 5–7, obscure; palea midwide, yellowish white; spikelet separation by fracture, basal scar absent to obscure, occasional short basal hair present; floret separation by heterofracture to fracture, distal; awns numerous, subgeniculate to twisted and geniculate; kernel midplump; rachilla segment medium long, slender to medium wide; nonpubescent; no hairs on lemma.

Control C.I. 3603

Description.—Juvenile growth upright; culm midstout, leaves midwide, medium dark green; no pubescence on sheath or leaves.

Adult plant.—Early; midtall (100–110 cm); culms 2–4, midstout, nodal pubescence absent; leaves midwide, ligule present, medium dark green, nonpubescent; panicle equilateral, midlong (14–18 cm), and midwide (10–13 cm); rachis straight to recurved; usually 5 nodes, false node absent; branches 16–20, medium to long; spikelets 18–32; glumes yellow to reddish yellow, midlong (20–22 mm), usually fine in texture; florets 2–3; lemma yellow to reddish yellow, midlong (15–17 mm); nerves 7, obscure; palea midwide, yellow to reddish yellow; spikelet separation by fracture; basal scar absent to slight; basal pubescence absent to occasional long; floret separation by fracture, distal or heterofracture; awns occasional, straight to subgeniculate; kernel midplump; rachilla segment short to medium, slender, nonpubescent; no hairs on back of lemma.

Dasix C.I. 4161

C.A.N. 656

Description.—Juvenile growth upright; culm stout, hairs on sheath absent; leaf midwide, medium dark green, occasional hairs on lower leaf near base of nodes.

Adult plant.—Late; midtall (104–127 cm); culms 1–5, stout, occasional hairs above and below nodes; leaf midwide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, long (18–22 cm), and wide (11–14 cm); rachis straight to recurved; nodes 5–7, false node absent; branches (14–29) long, straight to raised and raised to drooping; spikelets 29–48; glumes white or reddish white, midlong (20–22 mm), fine to coarse in texture; florets 2–3; lemma yellowish white, long (18–20 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal pubescence present; floret separation by fracture, distal or heterofracture, occasional very short pubescence on base of second kernel; awns occasional twisted to geniculate; kernel slender to midplump; rachilla segment short to midlong and slender, nonpubescent; no hairs on lemma.

Diana C.I. 7921

Description.—Juvenile growth upright; culm medium slender, often pink; sheath slightly pubescent; leaf narrow, few hairs on margins.

Adult plant.—Medium late; tall (122–130 cm); culms 2–3, medium stout, very few hairs above and below nodes; leaf medium narrow, ligule present, medium dark green, flag leaf erect, numerous hairs

on sheath and leaves; panicle equilateral, midlong (14–17 cm); rachis straight to slightly flexuous; nodes 7–8, false node absent; branches (17–19) midlong (7–8 cm), straight to raised; spikelets 26–32; glumes pink, midlong (19–22 mm), medium coarse in texture; florets usually 3; lemma very light yellowish red, very short (14–15 mm); nerves 7; palea very wide, yellowish red; spikelet separation by fracture, basal scar absent, occasional very short basal hairs; floret separation by heterofracture; awns absent; kernel exceedingly plump; rachilla segment long (2.5–2.75 mm) and very slender, nonpubescent; no hairs on lemma.

Eagle × (Hajira-Joanette: C.I. 4023)

C.I. 8111

C.A.N. 2464

Description.—Juvenile growth upright; culm slender; no hairs on sheath or leaf; leaf medium narrow; medium light green.

Adult plant.—Midseason; midtall (110–115 cm); culms 1–3, medium slender; nodal pubescence absent; leaf medium wide, medium light green; ligule present; pubescence usually absent on sheath and leaf; panicle equilateral, midlong (20–25 cm) and midwide (5–7 cm); rachis slender, slightly flexuous, recurved at tip; nodes 7–8, false node absent; branches 20–24, midlong; slender, straight to drooping; spikelets 42–60; glumes white, midlong (21–22 mm), fine in texture; florets 2, basal scar absent to very obscure; few short basal hairs present; lemma white, midlong (16–17 mm); nerves 7, obscure; palea midwide, yellowish white; spikelet separation by fracture, distal; awns very occasional, straight; kernel slender; rachilla segment midlong (1.75–2.00 mm); occasional short hair present; no hairs on back of lemma.

Early Joanette C.I. 1092

Description.—Juvenile growth very upright; culm slender, numerous hairs on sheath; leaf narrow, medium dark green, no hairs on margins.

Adult plant.—Early; midtall (109–112 cm); culms 2–4, medium slender, numerous hairs above nodes, few below; leaf medium narrow, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, midlong (13–26 cm) and medium wide; rachis straight to slightly flexuous; nodes 4–7, false node absent; branches (15–25) medium long, straight to drooping; spikelets 20–40; glumes white, midlong (20–25 mm), medium coarse in texture; florets 2–3; lemma black with white tip, midlong (15–17 mm);

nerves 7, distinct; palea midwide, black; spikelet separation by fracture, basal scar obscure, occasional short hairs present; floret separation by fracture, usually distal; awns occasional, straight; kernel medium plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Early Red Rustproof C.I. 2823

Description.—Juvenile growth upright; culm medium stout, sheath nonpubescent or occasional hair present; leaf narrow to midwide, occasional hair present, medium light green.

Adult plant.—Early; midtall (95–110 cm); culms 2–3, medium slender, pubescence few to numerous above and below nodes; leaf narrow to medium wide, often drooping, ligule present, medium light green, sheath and leaf nonpubescent; panicle equilateral, midlong (12–25 cm), medium to wide; rachis straight to flexuous; nodes 4–6, false node absent; branches (11–20) medium to usually long, straight to drooping; spikelets 20–40; glumes white to light red, medium to long (20–30 mm), fine to medium coarse in texture; florets 2, occasionally 3; lemma red to grayish red, midlong (15–18 mm); nerves 5–7; palea narrow, gray or grayish red; spikelet separation by semiabscission, basal scar absent to obscure, few, medium to long basal hairs; floret separation by basifracture; awns numerous, straight to twisted and geniculate; kernel slender to midplump; rachilla segment long, slender, nonpubescent; no hairs on lemma.

Edkin C.I. 2330

Description.—Juvenile growth upright; culm midstout; leaf midwide, pubescence absent on sheath and leaf margins; plant medium dark green.

Adult plant.—Midearly; midtall (108–110 cm); culms 3–4, midstout, pubescence absent at nodes; leaf midwide, medium dark green, ligule present; no hairs on leaves; panicle equilateral, medium long (17–23 cm), and medium wide; rachis straight to slightly flexuous, slightly recurved, medium slender; nodes 5–6, false node absent; branches 18–24, midlong, straight to drooping; spikelets 38–70; glumes white, midlong (18–22 mm), fine in texture; florets 2, occasionally 3; lemma yellow, midlong (18–19 mm); nerves 5–7; palea medium narrow, yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional, midlong basal hair

present; floret separation by fracture, distal; awns few to many, straight to slightly subgeniculate; kernel slender; rachilla segment midlong, slender; nonpubescent, no hairs on back of lemma.

Fortune C.I. 5226

C.A.N. 686

Description.—Juvenile growth upright; culm medium stout, no hairs on sheath; leaf midwide, no hairs on margins, medium dark green.

Adult plant.—Midseason; midtall to tall (117–145 cm); culms 1–4, hairs at nodes absent; leaf midwide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, midlong (15–25 cm), and wide (8–15 cm); rachis straight and recurved to straight and flexuous; nodes 5–7, false node absent; branches (14–27) midlong, straight to raised; spikelets 30–70; glumes white, midlong (18–24 mm), fine in texture; florets 2–3; lemma white, short to midlong (15–19 mm); nerves 7; palea midwide, white to yellow; spikelet separation by fracture, basal scar absent, basal hairs occasional, long; floret separation by fracture, distal, occasionally by heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Fundy C.I. 7288

C.A.N. 822

Description.—Juvenile growth upright; culm stout, reddish color, hairs on sheath absent; leaves midwide, medium dark green, no hairs on leaves.

Adult plant.—Midearly; short to midtall (74–122 cm); culms 2–5, hairs at nodes absent; leaf midwide, ligule present, medium dark green, hairs on leaves absent; panicle equilateral, midlong (14–22 cm) and medium wide; rachis straight; nodes 5–6, false node absent; branches (14–28) medium long, raised to straight; spikelets 16–41; glumes white, medium long (21–23 mm), fine in texture; florets 2–3, lemma white, medium long to long (16–20 mm); nerves 7; palea narrow, yellow; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by fracture, distal or heterofracture; awns numerous, straight and twisted, geniculate; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Glen C.I. 7652**C.A.N. 826**

Description.—Juvenile growth upright; culm very stout, slight or no pubescence on sheath or leaf; leaf wide, slightly glaucous, few hairs on margins.

Adult plant.—Late; tall (109–150 cm); culms 2–4, stout, hairs at nodes absent; leaf midwide, ligule present, slightly glaucous, hairs on leaves and sheath absent; panicle equilateral, midlong (20–24 cm), and wide; rachis straight to slightly flexuous; nodes 6–7, false node absent; branches (19–20) midlong (8–10 cm), straight to raised; spikelets 30–45; glumes pinkish white to red, midlong (24–26 mm), coarse in texture; florets usually 2; lemma yellowish white to red, long to very long (18–24 mm); nerves 7; palea midwide, yellow gray flecked to reddish yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short to long basal pubescence; floret separation by heterofracture; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment midlong and slender, occasional medium long rachilla hairs present; no hairs on lemma.

Hajira × Banner**C.I. 7438****Canada R.L. 524: C.A.N. 748**

Description.—Juvenile growth upright; culm medium stout, sheath and leaf margins nonpubescent; leaf medium wide, medium dark green.

Adult plant.—Midearly; midtall (110–115 cm); culms 2–3, medium slender, pubescence slight below nodes; leaf midwide, ligule present, medium dark green; pubescence absent on sheath and leaf margins; panicle equilateral, midlong (18–20 cm), and midwide (9–10 cm); rachis midstout, straight to slightly flexuous; nodes 6–7, false node absent; branches (16–18), midlong (9–12 cm), usually straight to raised; spikelets 15–36; glumes white, midlong (20–22 mm), fine in texture; florets 2, separating by fracture, usually distal to heterofracture; basal scar absent to very obscure; basal pubescence absent to few; lemma white, midlong (16–17 mm); nerves 7, obscure; palea midwide, white; awns numerous, subgeniculate to twisted, geniculate; kernel medium slender; rachilla segment midlong (2–2.5 mm), slender, nonpubescent; no hairs on back of lemma.

Hajira × Joannette**C.I. 4023****C.A.N. R.L. 811**

Description.—Juvenile growth intermediate to upright; culms slender; sheath and leaf margins nonpubescent; leaf medium narrow, medium dark green.

Adult plant.—Midearly; midtall (118–122 cm); culms 2–3, medium slender; pubescence few, short above and below nodes; leaf midwide, ligule present, medium dark green; pubescence on sheath and leaf margins; panicle equilateral, midlong (18–26 cm), and midwide (8–10 cm); rachis slender, straight to slightly flexuous; nodes 6–7, false node absent; branches (15–17), medium short (5–7 cm), straight to raised; spikelets 23–25; glumes white, midlong (20–22 mm), fine in texture; florets 2, separating by fracture, distal; basal scar absent to very obscure; basal pubescence few, long; lemma yellowish white, medium short (15–16 mm); nerves 7, obscure; palea midwide, yellowish white, tinged with gray; awns absent to few, straight; kernel medium slender; rachilla segment midlong (2–2.25 mm), slender, pubescence few, long; no hairs on back of lemma.

Hawkeye C. I. 2464

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaf; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall (116–120 cm); culms 2–3, mid-stout, nonpubescent at nodes; leaf midwide, medium dark green, ligule present; no hairs on leaf or sheath; panicle equilateral, midlong (19–25 cm), and midwide; rachis straight, midslender; nodes 5–6; false node absent; branches 19–28, short, stiff, slightly raised; spikelets 38–68; glumes white, midlong (20–22 mm), fine in texture; florets 2, lemma yellowish white, gray tinged, midlong (16–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, distal to heterofracture; basal scar absent; basal pubescence absent to occasional short hairs; awns occasional, straight; kernel medium slender; rachilla segment midlong, slender, nonpubescent; no hairs on back of lemma.

Hay C.I. 1622

Description.—Juvenile growth upright; culm medium slender; no hairs on sheath or leaves; plant color medium light green.

Adult plant.—Very early; midshort (90–112 cm); culms 2–3, slender, no pubescence at nodes; leaf midwide, ligule present, medium light green, nonpubescent; panicle equilateral, midlong (20–22 cm), and midwide; rachis slender, recurved at tip; nodes 4–5, false node absent; branches 12–22, long, drooping; spikelets 21–36; glumes white with reddish tinge near base, midlong (20–21 mm), fine in texture; florets usually 2 only; lemma dark gray with white tip, midshort (16–17 mm); nerves 5–7, prominent; palea midwide, gray; spikelet separation by fracture, basal scar absent to obscure, occasional long basal hairs present; floret separation by heterofracture to fracture, distal; awns numerous, twisted and geniculate; kernel intermediate to slender; rachilla segment midlong to long, very slender, nonpubescent; no hairs on back of lemma.

Hudson C.I. 1906

Description.—Juvenile growth semierect; culm medium slender; occasional hairs on sheath and leaf margin; leaf midwide, medium dark green.

Adult plant.—Midearly; midtall (111–123 cm); culms 2–3, medium stout, few hairs at nodes above and below; leaf midwide; ligule present, medium dark green; no hair on sheath or margin; panicle equilateral, medium long (17–22 cm), and medium wide; rachis medium slender, often recurved at tip; nodes usually 5; false node absent; branches (14–23) midlong, slender, inclined to be stiff, slightly raised to slightly drooping at ends; spikelets 21–41; glumes white, midlong (21–22 mm), medium fine in texture; florets 2 to occasionally 3; lemma white, sometimes grayish at base, midlong (17–18 mm); nerves 5–7, obscure; palea midnarrow, white; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, midlong; floret separation by fracture, distal; awns occasional, straight to subgeniculate; kernels slender; rachilla midlong and slender with occasional to few midlong hairs present; no hair on back of lemma.

Iowa No. D67 C.I. 2870

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midearly; midtall (99–122 cm); culms 1–3, medium stout, no hairs at nodes; plant color medium dark green; leaf midwide, ligule present, no hairs on leaves or sheath; panicle equilateral, midlong (15–20 cm), and medium wide; rachis straight

to slightly flexuous, midslender, recurved; nodes 5-6, false node absent; branches (16-23) medium to long, straight to drooping; spikelets 25-50; glumes white to reddish white, midlong (21-25 mm), fine to medium fine in texture; florets 2; lemma yellow to grayish white, midlong (16-19 mm); nerves 7; palea midwide, usually light gray; spikelet separation by fracture, basal scar absent, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel medium to slender; rachilla segment medium to long and slender, occasional, short pubescence; no hairs on lemma.

Iowa D69 C.I. 2463

Description.—Juvenile growth upright; culm midstout; leaves midwide, medium dark green, no pubescence on sheath or leaves.

Adult plant.—Midearly; midtall (114-125 cm); culms 2-3, midstout, nonpubescent; leaf midwide, medium dark green, ligule present, no pubescence on sheath or leaves; panicle equilateral, midlong (16-24 cm), and midwide; rachis straight, stiff, midstout, nodes 6-7, false node absent; branches (20-25) midshort, stiff, often raised in attitude; spikelets 34-78; glumes white, midlong (19-22 mm), medium fine in texture; florets usually 2; lemma yellow, midlong (16-17 mm); nerves usually 7; palea narrow to midwide, yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, very short to midlong; floret separation by fracture, distal; awns occasional, straight; kernel slender; rachilla segment long, very slender; nonpubescent; no hairs on lemma.

Johnson C.I. 5105

Description.—Juvenile growth upright; culm stout; pubescence few to absent on sheath and leaf margins; leaf medium wide, medium dark green.

Adult plant.—Midlate; tall (145-150 cm); culms 3, stout, pubescence numerous above and below nodes; leaf midwide, ligule present, hairs on sheath and leaves few to absent; panicle equilateral, midlong (20-28 cm), and wide; rachis slender, slightly flexuous and somewhat recurved; nodes 6-7, false node absent; branches (15-21) slender, long (9-15 cm), straight to raised to drooping; spikelets 37-40; glumes yellowish white, slightly pink, long (21-22 mm), medium fine in texture; florets 2; lemma yellow to yellowish white, short (15-16 mm); nerves 5-7; palea narrow, yellowish white; spikelet separation by fracture, basal scar absent to very

obscure, few medium to medium long basal hairs; florets separate by fracture, distal; awns few, straight; kernel slender; rachilla segment long (2–2.5 mm) and slender, occasional short to midlong rachilla hairs; no hairs on lemma.

Jostrain C.I. 2660

Description.—Juvenile growth upright; culm midslender, pubescence absent or occasional on sheath and leaf; leaf midwide, medium light green.

Adult plant.—Midseason; midtall (105–120 cm); culms 2–4, medium slender, nodal pubescence occasional below; leaf midwide, medium light green, ligule present; pubescence occasional to absent on sheath or leaf margins; panicle midlong (18–22 cm) and midwide (10–12 cm); rachis slender, slightly flexuous, recurved at tip; nodes 6–7, false node absent; branches 22–28, medium to long, midslender, straight to drooping; spikelets 19–29; glumes white, midlong (20–23 mm), medium fine in texture; florets 2; lemma black with light-colored tip, midlong (15–17 mm); nerves 7, medium prominent; palea midwide, black; spikelet separation by fracture; basal scar absent to obscure; basal pubescence numerous, midlong; floret separation by fracture, distal; awns occasional, straight to slightly subgeniculate; kernel midplump; rachilla segment midlong (1.5–2.0 mm), midwide; pubescence absent to occasional, long; no hairs on back of lemma.

Kent C.I. 3909

Description.—Juvenile growth upright; culm stout, very slightly red; pubescence absent on sheath and leaf margins; leaf medium wide, dark green.

Adult plant.—Midearly; midtall (104–114 cm); culms 2–4, stout, nodal pubescence occasional, short both above and below nodes; leaf medium wide, ligule present, pubescence absent, dark green; panicle equilateral, midlong (13–25 cm), and narrow to midwide; rachis stout, straight to flexuous; nodes 4–5, false node absent; branches (12–25) midlong, straight to raised; spikelets 17–34; glumes white, midlong (17–23 mm), fine to medium in texture; florets 2–3; lemma yellowish white, gray flecked, short (14–16 mm); nerves 7; palea midwide, gray flecked, yellowish white; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation usually by heterofracture; awns occasional straight to subgeniculate; kernel medium plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Lanark C.I. 4981**C.A.N. 733**

Description.—Juvenile growth upright; culm stout; few hairs on sheath, numerous on leaf margins; leaf medium wide, medium dark green.

Adult plant.—Midearly; midtall to tall (112–122 cm); culms 2–4, no hairs above or below nodes; leaf midwide, ligule present, few hairs on sheath or leaf margins, color medium dark green; panicle equilateral, midlong (19–20 cm), and medium to wide (13–15 cm); rachis straight; nodes 5–7, false node absent; branches (18–23) long, straight to raised or drooping; spikelets 22–47; glumes white, midlong (21–24 mm), medium fine in texture; florets 2–3; lemma white to reddish white, midlong (16–18 mm); nerves 7; palea midwide, white to yellowish white; spikelet separation by fracture, basal scar obscure to absent, numerous short basal hairs; floret separation by fracture, distal; awns numerous, straight to twisted, geniculate; kernel slender to midplump; rachilla segment medium in length and width, nonpubescent; no hairs on lemma.

Larain C.I. 6541**C.A.N. 692**

Description.—Juvenile growth very upright; culm stout, slightly red; pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midseason; medium to tall (109–130 cm); culms 1–4, stout, occasional hairs above nodes; leaf midwide, ligule present, hairs on sheath and leaves absent; panicle equilateral, midlong (17–23 cm), and wide; rachis straight to flexuous; nodes 5–6, false node absent; branches (14–22) long, straight to raised; spikelets 27–48; glumes white, midlong (18–22 mm), fine in texture; florets 2–3; lemma white to gray, midlong (16–19 mm); nerves 5–7; palea midwide, white or yellow to gray; spikelet separation by fracture, basal scar absent to obscure, occasional short basal hairs present; floret separation by fracture, distal; awns occasional, straight; kernel midplump; rachilla segment medium in length and width, occasional short rachilla hairs present; no hairs on lemma.

La Salle C.I. 5628

Description.—Juvenile growth upright; culms very slender, red at base; pubescence absent on sheath and leaf margins; leaf medium narrow, medium light green.

Adult plant.—Early; usually short (69–102 cm); culms 2–4, me-

dium slender, no pubescence at nodes; leaf narrow and erect, ligule present, few or no hairs on sheath and leaf margins, plant color medium light green; panicle equilateral, midlong (13–20 cm), and wide (8–14 cm); rachis straight to flexuous; nodes 4–5, false node absent; branches (12–20) long, straight to raised; spikelets 17–37; glumes white, midlong (18–23 mm), fine in texture; florets 2, occasionally 3; lemma yellow to reddish yellow, midlong (16–18 mm); nerves 5–7; palea midwide, yellow to yellowish gray; spikelet separation by fracture, basal scar absent, occasional medium long basal hair present; floret separation by heterofracture; awns occasional, straight; kernel slender to midplump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Logan C.I. 6929

Description.—Juvenile growth upright; culm stout; pubescence absent on sheath and leaf margins; leaf medium wide, medium dark green.

Adult plant.—Midearly; midtall (99–117 cm); culms 1–4, hairs at nodes absent; leaf midwide, ligule present, hairs on sheath and leaves absent, medium dark green; panicle equilateral, short to midlong (14–25 cm), and midwide; rachis midstout, slightly flexuous, straight to recurved; nodes 4–7, false node absent; branches (12–25) medium long, drooping; spikelets 17–38; glumes white to reddish white, midlong (17–22 mm), fine to medium in texture; florets 2; lemma reddish white to reddish yellow, midlong (16–18 mm); nerves 7; palea midwide, yellow to grayish red; spikelet separation by fracture, basal scar absent to obscure, occasional long basal pubescence; floret separation by heterofracture; awns occasional, straight; kernel slender to midplump; rachilla segment short to medium long, slender to wide, nonpubescent; no hairs on lemma.

Magnif 28 C.I. 7654

Description.—Juvenile growth upright; culm midstout; no hair on sheath or leaves; leaf midwide, medium dark green, somewhat glaucous.

Adult plant.—Late; short (80–85 cm); culms 3–4, nodal pubescence absent; leaf midwide, ligule present, somewhat glaucous, nonpubescent; panicle equilateral, midshort (14–15 cm), midwide; rachis straight; nodes 6–7, false node absent; branches (10–12) midlong, midstout; spikelets 12–18; glumes yellow, short (16–17 mm), medium in texture; florets 2–3; lemma yellow, short (12–13

mm); nerves 7, medium obscure; palea midwide, yellow; spikelet separation by fracture; basal scar absent, nonpubescent; floret separation by fracture, usually distal; awns absent; rachilla segment nonpubescent; no hairs on lemma.

Magnif 29 C.I. 7655

Description.—Juvenile growth intermediate to decumbent; culm stout; few hairs on culm or sheath; leaves medium to wide, hairs on leaves absent, leaf medium dark green, somewhat glaucous.

Adult plant.—Midearly; midtall (100–105 cm); culms 2–3, stout, few hairs above and below nodes; leaf midwide, ligule present, few hairs on lower leaves, plant color medium dark green, glaucous; panicle equilateral, midlong (18–30 cm), and midwide; rachis straight to flexuous; nodes 6–7, false node absent; branches (10–20) midlong, raised; spikelets 17–18; glumes white, pinkish tinged, short (17–19 mm), medium in texture; florets 2; lemma reddish tinged with gray, very short (13–14 mm); nerves 5; palea very wide, light to dark gray; spikelet separation by fracture, basal scar absent, occasional long basal hair present; floret separation by fracture, distal; awns very occasional, straight; kernel very plump; rachilla segment long (2–2.5 mm) and very slender, nonpubescent; no hairs on lemma.

Milford C.I. 7320

Description.—Juvenile growth upright; culm stout, pubescence on sheath, few hairs on leaf margins; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall (95–99 cm); culms 2–3, stout, numerous pubescence above and below nodes; leaf midwide, ligule present, pubescence present on sheath and leaf margins, dark green; panicle equilateral (somewhat compact), short (15–17 cm), and narrow (6–8 cm); rachis straight; nodes 6–7, false node absent; branches (17–22) short (3–3.5 cm), raised; spikelets 33–43; glumes white, midlong (20–21 mm), medium in texture; florets 2; lemma yellowish white, short (15–16 mm); nerves 5–7, obscure; palea midwide, white to yellow, tinged with gray; spikelet separation by fracture, basal scar absent, basal pubescence absent; floret separation by fracture, distal; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment long (2–2.5 mm) and slender, nonpubescent; no hairs on lemma.

Minrus C.I. 2144

Description.—Juvenile growth upright; culm medium slender; pubescence absent on sheath and leaf; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall (120–130 cm); culms 2–5, medium slender; nodal pubescence absent; leaf midwide, ligule present; color medium dark green, slight or no pubescence on sheath or leaf; panicle equilateral, midlong (20–25 cm), and wide (9–11 cm); rachis straight to slightly flexuous, recurved at tip; nodes 6–7, false node absent; branches (21–31) midlong, straight to drooping; spikelets 40–56; glumes white, midlong (25–26 mm), fine in texture; florets 2; lemma white, midlong (19–21 mm); nerves 7; palea midwide, yellowish white; spikelet separation by fracture; basal scar absent, pubescence occasional, short; floret separation by fracture, distal; awns usually absent; kernel medium slender; rachilla segment short (1.5–2 mm), midwide, nonpubescent; no hairs on back of lemma.

Minton C.I. 6935⁸

Description.—Juvenile growth upright; culms very stout, no hairs on sheath, few on lower leaf margins; leaf midwide, slightly red.

Adult plant.—Midearly; midtall (100–104 cm); culms 2–3, medium slender; nodal pubescence absent; leaf midwide, ligule present, no hairs on leaf; panicle equilateral, midlong (15–17 cm), 6–7 cm wide; rachis straight, slender; nodes 5–7, false node absent; branches (16–19), 6–7 cm long, raised; spikelets 18–25; glumes red, midlong (19–22 mm), medium fine in texture; florets 2; lemma yellow, some red tinged, short (15–16 mm); spikelet separation by fracture, basal scar absent to obscure, few short basal hairs; floret separation by heterofracture; awns occasional, straight, subgeniculate; kernel plump; rachilla segment midlong and slender, few short rachilla hairs; no hairs on lemma.

Miomark C.I. 3418

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; occasional hairs on sheath and leaf.

Adult plant.—Midseason; midtall (105–120 cm); culms 2–5; midstout; pubescence numerous above, few below nodes; leaf midwide, medium dark green, slightly pubescent; ligule present; panicle

⁸ Minton, C.I. 2574, a sister strain of Marida C.I. 2571, Reg. No. 100.

equilateral, midlong (15–20 cm), and midwide (12–15 cm); rachis straight to flexuous, recurved at tip; nodes 5–7; false node absent; branches (15–24) long, straight to drooping; spikelets 20–40; glumes white, midlong (20–24 mm), medium fine in texture; florets 2–3; lemma reddish white, midlong (18–19 mm); nerves 7; palea midwide, grayish red to grayish yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence absent; floret separation by fracture, distal to heterofracture; awns numerous, straight to subgeniculate; kernel midplump to slender; rachilla segment medium long, midwide to slender, nonpubescent; no hairs on lemma.

Nebraska 21 C.I. 1371

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; no hairs on leaf or sheath.

Adult plant.—Early; short to midtall (100–110 cm); culms 3–4, slender, no hairs at nodes; leaf narrow to midwide, ligule present, medium dark green; no hairs on sheath or leaf margins; panicle equilateral, midlong (15–22 cm), medium wide (6–9 cm); rachis straight to slightly flexuous, slender, often slightly recurved at tip; nodes 5–6, false node absent; branches 14–22, midlong, straight to slightly drooping; spikelets 16–24; glumes white, midlong (18–23 mm), fine in texture; florets 2, occasionally 3; lemma white, sometimes grayish white at base, midlong (17–18 mm); nerves 7; palea narrow, white, sometimes gray flecked; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence occasional, short; floret separation by fracture, distal; awns occasional, straight to slightly subgeniculate; kernel slender; rachilla segment midlong and slender, nonpubescent; no hairs on back of lemma.

(Ontario Agricultural College) O.A.C. 72 C.I. 846

Description.—Juvenile growth medium upright; culm stout, pubescence present on sheath and leaves; leaf medium wide, medium dark green.

Adult plant.—Midseason; short to usually tall (85–145 cm); culms 1–2, medium stout, pubescence very numerous above and below nodes; plant often reddish color; leaf midwide, ligule present, hairs present, few on sheath and leaves, leaves medium dark green; panicle equilateral, long (18–28 cm), and wide (10–12 cm); rachis stout, straight to flexuous; nodes 4–7, false node absent; branches (17–26) long (10–14 cm), straight to drooping, but sometimes a few are raised in attitude; spikelets 31–49; glumes often pinkish or

slightly red, midlong (22–25 mm), medium coarse in texture; florets 2; lemma very light yellow, often reddish tinged, midlong to long (17–20 mm); nerves 5–7, prominent; palea midwide, yellowish red or reddish yellow; spikelet separation by fracture to semiabscission, basal scar obscure to intermediate, few midlong to long basal hairs present; floret separation by fracture, distal or basifracture; awns few to many, straight to subgeniculate; kernel slender to midplump; rachilla segment medium to long and very slender, few medium long rachilla hairs present; no hairs on lemma.

(Ontario Agricultural College) O.A.C. 144 C.I. 2476

Description.—Juvenile growth upright; culm stout; few hairs on sheath and on lower leaf margins; leaf medium wide and medium dark green.

Adult plant.—Midseason; midtall to tall (107–150 cm); culms 1–3, stout, numerous hairs above and below nodes; plant color medium dark green; leaf wide, ligule present, few hairs on sheath and leaf margins; panicle equilateral, long (24–32 cm), and wide (17–19 cm); rachis straight to flexuous; nodes 5–7, false node absent; branches (24–33) long, raised; spikelets 54–84; glumes white with pinkish tinge, long (22–27 mm), medium fine to medium coarse in texture; florets 2–3; lemma yellowish white to reddish yellow, midlong (18–20 mm); nerves 5–7; palea midwide, white to yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel slender to midplump; rachilla segment medium to long and slender, very occasionally short rachilla hairs present; no hairs on lemma.

Opala C.I. 7399

Description.—Juvenile growth intermediate to upright; culm intermediate to stout; pubescence absent on sheath and leaves; leaf intermediate in width, medium dark green, slightly glaucous.

Adult plant.—Late; midtall (112–130 cm); culms 3–4, few to numerous hairs above and below nodes; plant color medium dark green, very slightly glaucous; leaf midwide, ligule present, hairs absent on sheath and leaves; panicle equilateral, midlong (20–30 cm), and midwide (6–7 cm); rachis straight to flexuous; nodes 5–7, false node absent; branches (12–16) midlong (6–7 cm), slightly raised; spikelets 29–37; glumes yellow, midlong (21–22 mm), medium coarse in texture; florets 2; lemma yellow, short to midlong (16–17 mm); nerves 5–7; palea midwide, yellow; spikelet separation

by fracture, basal scar absent to obscure, pubescence absent; floret separation by heterofracture; awns absent; kernels midplump; rachilla segment midlong to long (2–2.5 mm) and slender, occasional long hairs present on rachilla segment; no hairs on lemma.

Palomino C.I. 5636

Description.—Juvenile growth upright; culm medium stout, red; pubescence absent on sheath and leaves; leaf medium wide, medium dark green.

Adult plant.—Midearly; midtall (97–117 cm); culms 2–5, midstout, pubescence absent on sheath and nodes; leaf midwide, ligule present, nonpubescent, medium dark green; panicle equilateral, midlong (15–25 cm), and medium to wide (9–13 cm); rachis straight, occasionally somewhat flexuous, midslender, frequently recurved at tip; nodes 5–6, false node absent; branches (14–25) midlong to long, raised, straight to drooping; spikelets 20–50; glumes white, midlong (19–25 mm), fine to medium in texture; florets 2–3; lemma yellow, midlong (16–19 mm); nerves 7; palea narrow, yellow, occasionally flecked with gray; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent; floret separation by heterofracture; awns absent; kernel slender; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

Pendek C.I. 7801

Description.—Juvenile growth medium decumbent; culm stout, no hairs on sheath; leaf medium wide, nonpubescent, medium dark green.

Adult plant.—Midseason; short to midtall (84–100 cm); culms 1–3, very stout, somewhat pinkish, pubescence absent at nodes; leaf midwide, ligule present, pubescence present on sheath and leaves, medium dark green; panicle equilateral, short (11–15 cm), and midwide (5–8 cm); rachis stout, straight to slightly recurved; nodes 5–6, false node absent; branches (17–20) midlong (7–8 cm), straight to raised; spikelets 31–59; glumes white to yellow, midlong (18–22 mm), medium fine to coarse in texture; florets 2–3; lemma white to yellow, glaucous, very short (13–15 mm); nerves 5–9; palea very wide, grayish yellow to yellowish white; spikelet separation by fracture, basal scar obscure, occasional short basal hairs present; floret separation by heterofracture; awns occasional, straight to subgeniculate; kernel extremely plump; rachilla segment long (2–3 mm) and very slender, nonpubescent; no hairs on lemma.

Pennfield C.I. 7571

Description.—Juvenile growth semidecumbent; culm very stout; few hairs on sheath and culm, none on leaves; leaf intermediate in width, medium dark green.

Adult plant.—Late; tall (125–130 cm); culms 3–4, stout, numerous pubescence above and below nodes; leaf midwide, ligule present, few hairs on sheath, absent on leaves, medium dark green, slightly glaucous; panicle equilateral, midlong (16–18 cm), and midwide (9–10 cm); rachis usually straight, stout; nodes 6–7, false node absent; branches (15–18) medium long (9–10 cm), stout, stiff, straight to raised; spikelets 25–30; glumes yellow, midlong (21–22 mm), medium in texture; florets 2, often 3; lemma light yellowish white, midlong (15–17 mm); nerves 7; palea yellow to yellowish white; spikelet separation by fracture, basal scar absent to obscure, basal pubescence absent, floret separation by fracture, distal to heterofracture; awns occasional, straight to subgeniculate; kernel midplump; rachilla segment midlong (2–2.5 mm) and medium wide, nonpubescent; no hairs on lemma.

Putnam 61 C.I. 7531

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaves midwide, medium dark green.

Adult plant.—Medium early; midtall (112–115 cm); culms 2–4, no pubescence at nodes; leaf midwide, ligule present, medium dark green, no pubescence on sheath and leaf; panicle equilateral, midlong (15–25 cm), and wide (10–13 cm); rachis straight to flexuous; nodes 6–7, false node absent; branches (17–20) short (7–8 cm), straight to raised; spikelets 24–30; glumes red, midlong (21–25 mm), coarse in texture; florets 2–3; lemma reddish yellow, gray flecked, midlong (17–18 mm); nerves 5–7; palea midwide, reddish gray; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence absent; floret separation by heterofracture; awns few, straight; kernel midplump; rachilla segment midlong (2–2.25 mm) and medium in width, nonpubescent; no hairs on lemma.

Richland 52 C.I. 3002

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; leaf and sheath nonpubescent.

Adult plant.—Midearly; midtall (100–110 cm); culms 2–4, midstout, pubescence absent at nodes; plant color medium dark green;

leaf midwide, ligule present, no hairs on sheath or leaf margins; panicle equilateral, midlong (18–19 cm), and medium wide; rachis slender, stiff, straight to slightly flexuous, recurved at tip; nodes 4–5, false node absent; branches 13–20, midlong, straight to slightly raised; spikelets 18–35, glumes white, midlong (19–20 mm), fine in texture; florets 2, occasionally 3; lemma yellow, short (16–17 mm); nerves 7, obscure; palea medium narrow, yellow; spikelet separation by fracture; basal scar absent, occasional midlong basal hair present; floret separation by fracture, distal; awns few and straight to occasional and subgeniculate; rachilla segment midlong, slender, nonpubescent; no hairs on lemma.

Roxton C.I. 4134**C.A.N. 658**

Description.—Juvenile growth upright; culm medium stout, often slightly red; pubescence absent on leaves, few hairs on sheath and culm; leaves medium wide, medium dark green.

Adult plant.—Late; tall to very tall (117–160 cm); culms 1–4, midstout, pubescence above and below nodes; leaf wide, ligule present, medium dark green, few hairs on sheath and leaves; panicle equilateral, long (19–28 cm), and very wide (15–18 cm); rachis straight to recurved; nodes 6–7, false node absent; branches (15–30) long (10–12 cm), drooping usually; spikelets 29–60; glumes white to reddish white, midlong (20–24 mm), fine to medium coarse in texture; florets 2; lemma white to reddish white, midlong (16–18 mm); nerves 7; palea midwide, white to yellow; spikelet separation by fracture, basal scar absent to very obscure, long basal pubescence occasionally present; floret separation by fracture, distal or heterofracture; awns occasional, straight; kernel midplump; rachilla segment medium to long and slender, occasional pubescence on back of secondary kernel; no hairs on lemma.

Russell C.I. 7557**C.A.N. 844**

Description.—Juvenile growth upright; culm stout, often colored reddish; pubescence absent on leaves and sheath; leaf medium wide, medium dark green.

Adult plant.—Midseason; midtall (112–120 cm); culms 2–4, stout, no pubescence at nodes; leaf midwide, ligule present, no pubescence on sheath or margins; panicle equilateral, midlong (15–25 cm), and midwide (10–13 cm); rachis straight to flexuous; nodes 6–7, false node absent; branches (18–20) midlong (6–8 cm), straight; spikelets 26–33; glumes white, midlong (21–23 mm), medium in

texture; florets 2-3; lemma yellowish white, midlong (16-17 mm); nerves 5-7; palea midwide, yellow; spikelet separation by fracture, basal scar obscure, basal pubescence absent; floret separation by fracture, distal; awns numerous, straight to subgeniculate; kernel midplump; rachilla segment short to midlong (1.5-1.75) and medium slender, nonpubescent; no hairs on lemma.

Sac C.I. 3907

Description.—Juvenile growth upright; culm stout, slightly red in color; pubescence absent on sheath and leaves; leaves medium wide, medium dark green.

Adult plant.—Midearly; midtall (97-119 cm); culms 1-3, stout, numerous pubescence above and below nodes; leaf medium narrow, ligule present, pubescence absent on sheath and leaves, medium dark green; panicle equilateral, midlong (15-25 cm), and midwide; rachis straight to flexuous; nodes 5-6, false node absent; branches (14-23) short to medium long, raised to straight; spikelets 23-38; glumes white, often tinged pink, midlong (18-25 mm), fine to coarse in texture; florets 2; lemma yellow, gray flecked, short to midlong (14-17 mm); nerves 7; palea midwide, yellow, often grayish flecked; spikelet separation by fracture, basal scar absent to obscure, occasional short basal pubescence present; floret separation by heterofracture; awns few, straight to subgeniculate to twisted, geniculate; kernel plump; rachilla segment short to medium long, slender, nonpubescent; no hairs on lemma.

Scotian C.I. 7203

C.A.N. 815

Description.—Juvenile growth upright; culm very stout; pubescence absent on sheath, few hairs on lower leaf margins; leaf medium wide, medium light green.

Adult plant.—Midseason; tall (122-135 cm); culms 2-3, few to numerous hairs above and below nodes; leaf midwide, ligule present, light green, hairs on leaves absent; panicle equilateral, midlong (15-22 cm), and wide (8-11 cm); rachis midstout, straight to recurved; nodes 5-7, false node absent; branches (17-24) medium long, straight to raised, or drooping; spikelets 23-58; glumes white, midlong (22-24 mm), medium in texture; florets 2-3; lemma yellowish white, midlong to long (18-21 mm); nerves 7; palea midwide, white to yellowish gray; spikelet separation by fracture, basal scar absent, pubescence absent; floret separation by fracture, distal; awns numerous, twisted, geniculate; kernel midplump; rachilla

segment medium long and slender, nonpubescent; no hairs on lemma.

Shasta C.I. 3976

Description.—Juvenile growth upright; culm medium stout; pubescence absent on leaves and sheath; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall to tall (112–150 cm); culms 1–3, numerous pubescence above nodes, few below; leaf midwide, ligule present, medium dark green, pubescence absent on sheath and on leaves; panicle equilateral, midlong (18–27 cm), and wide to very wide; rachis straight to recurved; nodes 5–7, false node absent; branches (15–36) long, straight to drooping; spikelets 38–71; glumes white, midlong (20–25 mm), fine to medium in texture; florets 2–3; lemma yellowish white to white, gray flecked, midlong (17–19 mm); nerves 7; palea midwide, white to yellow; spikelet separation by fracture, basal scar obscure, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional to numerous, straight, subgeniculate to twisted, geniculate; kernel medium slender; rachilla segment medium in length and width, occasional short to medium long rachilla hairs present; no hairs on lemma.

Shefford C.I. 6941

C.A.N. 735

Description.—Juvenile growth upright; culm slender; pubescence absent on sheath and leaves; leaf narrow, medium dark green.

Adult plant.—Midearly; midtall (99–107 cm); culm 1–5, pubescence absent at nodes; leaf midwide, ligule present, medium dark green, no hairs on sheath or leaves; panicle equilateral, midlong (15–25 cm), and wide; rachis straight to flexuous; nodes 5–7, false node absent; branches (16–25) medium long, straight to raised; spikelets 23–48; glumes white, often tinted pink, midlong to long (17–24 mm), fine to medium in texture; florets 2–3; lemma yellow to yellowish red, short to midlong (15–17 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar obscure, numerous medium to long basal pubescence present; floret separation by fracture, distal; awns occasional, straight; kernel midplump to plump; rachilla segment medium long and wide, occasional short to long rachilla hairs present; no hairs on lemma.

Shield C.I. 7209**C.A.N. 821**

Description.—Juvenile growth medium upright; culm stout, tinged with pink; pubescence absent on sheath and leaves; leaves midwide, medium dark green.

Adult plant.—Midearly; midtall (97–109 cm); culms 2–3, stout, occasional pubescence below nodes; leaf midwide, ligule present, medium dark green, pubescence absent on sheath and on leaves; panicle equilateral, midlong (18–25 cm), and wide; rachis straight to flexuous; nodes 4–6, false node absent; branches (16–20) midlong, straight to raised; spikelets 20–30; glumes white tinged with pink, midlong (21–28 mm), medium in texture; florets 2–3; lemma yellowish white, midlong (16–19 mm); nerves 7; palea medium narrow, yellow; spikelet separation by fracture, basal scar absent to obscure, occasional short basal pubescence present; floret separation by fracture, distal; awns occasional to numerous, straight to twisted, geniculate; kernel midplump; rachilla segment medium in length, slender, nonpubescent; no hairs on lemma.

South Dakota No. 334 C.I. 2884

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Early; midtall (95–110 cm); culms 2–3, midstout; nonpubescent at nodes; leaf midwide, medium dark green; ligule present; sheath and leaf nonpubescent; panicle equilateral, midlong (15–20 cm), and midwide (10–14 cm); rachis straight, midslender, recurved at tip, slightly flexuous; nodes 5–6, false node absent; branches 16–18, midlong, straight to drooping; spikelets 17–25; glumes white to slightly reddish tinted, midlong (21–24 mm), medium fine in texture; florets 2–3; lemma white, midshort (16–17 mm); nerves 7; palea midwide, light grayish white to grayish yellow; spikelet separation by fracture; basal scar absent to very obscure; basal pubescence present, occasional, short; floret separation by fracture, distal to heterofracture; awns present, numerous, straight to twisted, geniculate; kernel slender to intermediate in width; rachilla segment midlong, slender to midwide, nonpubescent; no hairs on lemma.

Tabor C.I. 1777

Description.—Juvenile growth upright; culm medium stout; pubescence absent on sheath and leaves; leaf narrow.

Adult plant.—Midlate; tall to very tall (145–210 cm); culms 1–2,

medium stout, occasional hairs above and below nodes; leaf medium wide, ligule present, medium light green or slightly reddish, pubescence absent on leaves; panicle equilateral, very long (25–40 cm), and widespread (10–15 cm); rachis straight, very long; nodes 4–7, false node absent; branches (14–31) slender, long to very long, straight to usually drooping; spikelets 30–74; glumes white, midlong (20–24 mm), fine in texture; florets 2; lemma white, midlong (18–19 mm); nerves 5, obscure; palea midwide, white to yellow; spikelet separation by fracture, basal scar absent; occasional, short basal pubescence present; floret separation by fracture, distal; awns absent; kernel slender; rachilla segment medium long to very long and slender, occasional short rachilla hairs; no hairs on lemma.

Tippecanoe C.I. 7680

Description.—Juvenile growth intermediate to upright; culm medium stout, often tinted pink; pubescence absent on sheath and leaves; leaf medium wide, medium dark green, slightly glaucous.

Adult plant.—Midseason; midtall (102–110 cm); culms 1–3, midstout, pubescence absent at nodes; leaf midwide, ligule present, medium dark green, slightly glaucous, pubescence absent on sheath; panicle equilateral, midlong (16–20 cm), and medium wide; rachis straight to slightly flexuous; nodes 5–6, false node absent; branches (12–15) usually short; spikelets 18–25; glumes yellow, midlong (19–20 mm), fine in texture; florets 2; lemma yellow, very short (13–14 mm); nerves 7; palea midwide, yellow; spikelet separation by fracture, basal scar obscure, occasional long basal pubescence present; floret separation by fracture, distal or heterofracture; awns few, subgeniculate to twisted, geniculate; kernel plump; rachilla segment midlong to long (1.5–2.5 mm) and medium slender, nonpubescent; no hairs on lemma.

Trojan C.I. 2491

Description.—Juvenile growth upright; culm slender to medium stout; pubescence occasional on culm, sheath, or margins, medium dark green.

Adult plant.—Early; short (81–92 cm); culms 2–3, medium slender, pubescence absent to occasional above, few to numerous below nodes; leaf medium narrow, ligule present, medium dark green, pubescence on sheath and leaf margin absent to occasional; panicle equilateral, short to medium long (15–25 cm), usually medium wide; rachis straight, occasionally slightly flexuous, slender and recurved; usually 4–6 nodes, false node absent; branches

(10–21) short to medium long, straight, raised to slightly drooping; spikelets 20–41; glumes white, medium long (15–20 mm), very fine in texture; florets usually 2; lemma white, medium long (15–18 mm); nerves 6–7, obscure; palea narrow, white; spikelet separation by fracture, basal scar absent to very obscure, pubescence absent to occasional, short; floret separation by heterofracture to fracture, distal; awns absent to occasional, straight; kernel very slender; rachilla segment long, slender, nonpubescent; no hairs on lemma.

Tyler C.I. 7679

Description.—Juvenile growth upright; culm medium slender, reddish colored; hairs on sheath and culm absent; leaves medium narrow, no hair on margins, plant color medium dark green.

Adult plant.—Medium late; tall (122–132 cm); culms 1–2, midstout to slender, slightly pink, hairs at nodes absent to few; leaf midwide, ligule present, flag leaf usually erect, medium green; panicle equilateral, midlong (18–25 cm), and midwide (6–7 cm); rachis very straight to slightly flexuous; nodes 6–7, false node absent; branches (23–25) long (10–12 cm), straight to drooping; spikelets 39–41; glumes yellow to yellowish white, midlong (17–18 mm), very fine in texture; florets usually 2; lemma white tinged with yellow, very short (13–14 mm); nerves 5–7, very obscure; palea midwide, white; spikelet separation by fracture, basal scar absent to very obscure, occasional short basal hair present; floret separation by fracture, distal to heterofracture; awns occasional, straight to subgeniculate; kernel medium slender; rachilla segment very long and slender, nonpubescent; no hairs on lemma.

Vanguard C.I. 3837

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green; sheath and leaf nonpubescent.

Adult plant.—Midseason; midtall (105–110 cm); culms 2–4, midstout, nonpubescent at nodes; leaf midwide, medium dark green, ligule present; sheath and leaf nonpubescent; panicle midlong (16–17 cm) and midwide; rachis straight to slightly flexuous; nodes 5–6, false node absent; branches 17–18, midshort, straight to slightly raised; spikelets 25–26; glumes white, midlong (20–33 mm), medium fine in texture; florets 2; lemma white, midlong (16–17 mm); nerves 7, obscure; palea midwide, white; spikelet separation by fracture; basal scar absent to obscure, basal pubescence few, medium short, floret separation by fracture, distal; awns few to numerous,

straight to subgeniculate; kernel plump; rachilla short, midwide, occasional short hair present; no hairs on lemma.

Vikota C.I. 3602

Description.—Juvenile growth upright; culm midstout; leaf midwide, medium dark green, sheath and leaf nonpubescent.

Adult plant.—Early, midtall (95–110 cm); culms 2–4, midstout, nonpubescent at nodes; leaf midwide, medium dark green, ligule present, sheath and leaf margin nonpubescent; panicle equilateral, midlong (19–22 cm), and midwide (10–12 cm); rachis straight to slightly flexuous, recurved at tip; nodes 4–5, false node absent; branches 15–19, short to midlong, straight to raised to slightly drooping; spikelets 20–30; glumes white to reddish white, midlong (19–22 mm), medium fine in texture; florets 2, occasionally 3; lemma yellow, midlong (16–18 mm); nerves 7, obscure; palea midwide, yellow to slightly reddish yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence absent to an occasional long hair present; floret separation by fracture, distal to heterofracture; awns occasional, straight to slightly subgeniculate; kernel midplump; rachilla segment midlong, midwide to slender, nonpubescent; no hairs on lemma.

White Bonanza C.I. 1686

Description.—Juvenile growth upright; culm stout, pubescence very numerous on sheath; leaf midwide, numerous pubescence on leaves, medium dark green.

Adult plant.—Midseason; midtall to tall (109–130 cm); culms 2–3, occasional to numerous pubescence both above and below nodes; leaf midwide, ligule present, medium dark green, occasional pubescence on leaf margins; panicle equilateral, long (18–30 cm), wide (10–11 cm); rachis midslender, recurved; nodes 5–7, false node absent; branches 14–25, very long, drooping; spikelets 19–53; glumes white, long (18–26 mm), fine in texture; florets 2; lemma white, midlong (16–18 mm); nerves 5–7, palea narrow, white to yellowish gray; spikelet separation by fracture, basal scar obscure, occasional short to long basal pubescence present; floret separation by fracture, distal; awns numerous, twisted and geniculate; kernel slender; rachilla segment long and slender, numerous short to medium long rachilla hairs present; no hairs on lemma.

SPRING-SOWN SIDE OAT VARIETIES IN THE UNITED STATES

In the United States and Canada few new varieties of side oats have been produced or released to growers in the last several decades. However, varieties released previously are still grown occasionally. A few are used in hybridization to produce new varieties, or in genetic and morphologic investigations.

Eight varieties registered by the American Society of Agronomy in 1926 and Black Rival are included in this publication. The recently received variety, Magistral, and the old disease-resistant variety, Schumaker No. 7, were left out by Stanton (1955). A total of 11 varieties of side oats are included, both registered and not registered (table 8).

White Russian was formerly grown in the Northern United States each year on several million acres. Derivatives resulting from hybrids have supplanted this parent variety. These derivatives have been chosen for "tree type" panicles.

Black Rival C.I. 807

Description.—Juvenile growth intermediate to upright; culm medium slender, pubescence on sheath numerous; leaf medium wide, pubescence numerous on lower leaf margins.

Adult plant.—Midseason; midtall (94–127 cm); culms 1–4, medium stout, occasional hairs below nodes; leaf midwide, ligule present, hairs present on lower portion of leaf margins; panicle unilateral, midlong (15–23 cm), and narrow; rachis straight to flexuous and recurved; nodes 5–7, false node present; branches (15–28) usually stiff, raised, medium to long; spikelets 32–89; glumes white, long (18–25 mm), medium coarse in texture; florets 2; lemma black with white tip, short to midlong (15–18 mm); nerves 5–9, obscure; palea wide, black; spikelet separation by fracture, occasional obscure basal scar may be present, occasional short basal pubescence present; floret separation by fracture, usually distal; awns numerous, straight to twisted and geniculate; kernel very plump; rachilla segment medium to long and slender, occasional very short hairs present; no hairs on lemma.

Black Tartar C.I. 991

Reg. No. 35

Description.—Juvenile growth upright; culm stout, slightly red, no hairs on culm or sheath; leaf midwide, no hairs on leaf.

Adult plant.—Late; midtall (97–132 cm); culms 1–4, stout, nonpubescent at nodes; leaf medium wide, ligule present, medium dark green, no hairs on sheath or leaf margins; panicle unilateral, midlong (15–23 cm), and medium narrow; rachis erect, slightly recurved; nodes 6–7, false node occasionally present; branches (17–24) medium long, usually stout, raised; spikelets 35–66; glumes white, long (22–27 mm), fine in texture; florets usually 2; lemma black with white tips, medium long to long (16–19 mm); nerves 5–7; palea medium narrow, black; spikelet separation by fracture, basal scar absent to obscure, occasional short to medium long basal pubescence present; floret separation by fracture, distal; awns numerous, straight to subgeniculate; kernel medium slender; rachilla segment midlong and slender, absent to occasional short hair present; no hairs on lemma.

Garton Gray C.I. 1864

Reg. No. 36

Description.—Juvenile growth upright; culm midstout, few hairs on sheath or culm; leaf narrow, medium dark green, hairs on leaf margins absent.

Adult plant.—Late; midtall to tall (107–147 cm); culms 1–3, stout, pubescence numerous above and few below nodes; leaf medium wide, ligule present, medium dark green, few to no hairs on margins; panicle somewhat variable, unilateral to semiequilateral, long (17–24 cm), usually narrow (4–5 cm); rachis usually straight; nodes 6–7, false node absent; branches (21–27) short to long, usually upright to raised; spikelets 34–53; glumes white, midlong (21–25 mm), fine to medium coarse in texture; florets 2, occasionally 3; lemma gray, midlong (17–18 mm); nerves 7, very prominent; palea midwide, gray; spikelet separation by fracture, no or obscure basal scar, occasional short basal pubescence present; floret separation by fracture, distal, but sometimes by heterofracture; awns numerous, subgeniculate to twisted, geniculate; kernel midplump; rachilla segment medium long and medium slender, nonpubescent; no hairs on lemma.

Golden Giant C.I. 1606

Reg. No. 37

Description.—Juvenile growth upright; culm medium stout, pubescence very numerous on sheath and culm; leaf medium narrow, medium dark green, numerous hairs on lower leaf margins.

Adult plant.—Midseason; midtall (112–127 cm); culms 1–3, midstout, numerous hairs above nodes, few below; leaf midwide, ligule

absent, plant medium dark green, hairs on leaves absent; panicle unilateral, midlong (17–24 cm), very narrow to medium wide; rachis straight to recurved; nodes 5–7, false node absent; branches (15–30) medium long, usually raised to straight; spikelets 27–73; glumes white, midlong (20–24 mm), fine in texture; florets 2; lemma yellow, gray tinged, midlong (17–18 mm); nerves 7; palea narrow, yellow to grayish yellow; spikelet separation by fracture, basal scar absent to very slight, basal pubescence occasional, short; floret separation by fracture, distal; awns numerous, subgeniculate to twisted, geniculate; kernel slender; rachilla segment short to medium long, slender to medium wide, pubescence occasional, short; no hairs on lemma.

Green Mountain C.I. 1892

Reg. No. 38

Description.—Juvenile growth upright; culm medium stout, pubescence absent on culm, sheath, and leaves; leaf midwide, medium dark green.

Adult plant.—Midseason; midtall to tall (112–132 cm); culms 2–4, no hairs at nodes; leaf midwide, ligule present, medium dark green, hairs on sheath or leaves absent; panicle unilateral, midlong (22–23 cm), and midwide (5–8 cm); rachis straight to recurved; nodes 5–7, false node absent usually; branches (20–32) long, raised; spikelets 36–57; glumes white, midlong (18–23 mm), fine in texture; florets 2; lemma white, short to midlong (14–17 mm); nerves 5–7, obscure; palea wide, yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence occasional, short; floret separation by fracture, distal; awns occasional to numerous, straight to subgeniculate; kernel very plump; rachilla segment medium long and slender with occasional short rachilla hairs; no hairs on lemma.

Magistral C.I. 2460

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf narrow, dark green color.

Adult plant.—Very late; very tall (150–160 cm); culms 2 usually, medium stout, hairs absent above and below nodes; leaf narrow, dark green, ligule present, hairs on leaves absent; panicle unilateral, long (28–30 cm), and very wide (14–16 cm); rachis medium slender, recurved; nodes 7–8, false node absent; branches (14–19) long (14–15 cm), slender, raised to drooping at ends; spikelets 41–79; glumes white, midlong (21–22 mm), fine in texture; florets 2;

lemma yellowish white, short to midlong (16–17 mm); nerves 7; palea narrow, yellowish white; spikelet separation by fracture, basal scar absent to obscure, few to numerous, short basal pubescence, floret separation by heterofracture; awns absent; kernel slender; rachilla segment long (2.75–3 mm) and very slender, pubescence occasional, medium long; no hairs on lemma.

Schumacher No. 7 C.I. 2895

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath and leaves; leaf medium narrow, medium dark green.

Adult plant.—Midseason; midtall to tall (112–145 cm); culms 1–3, stout, pubescence present above and below nodes; leaf medium wide, ligule present, pubescence absent on sheath and leaves; plant color medium dark green; panicle unilateral, midlong (14–25 cm), and wide (5–6 cm); rachis straight to slightly flexuous, recurved at tip; nodes 5–7, false node absent; branches (15–26) medium long, raised to upright; spikelets 35–68; glumes white to yellowish white, midlong (17–20 mm), fine in texture; florets 2; lemma white to yellow, gray flecked, very short (13–14 mm); nerves 5–7; palea midwide, yellow; spikelet separation by fracture, basal scar absent to very obscure, numerous short basal pubescence; floret separation by fracture, distal; awns absent; kernel slender; rachilla segment long and slender, nonpubescent; no hairs on lemma.

Sparrowbill C.I. 1604

Reg. No. 39

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaves; leaf narrow, medium to dark green.

Adult plant.—Midseason; midtall to tall (104–150 cm); culms 1–3, stout, pubescence absent at nodes; plant color dark green, slightly glaucous; leaf midwide, ligule present, slight or no pubescence on sheath or leaves; panicle unilateral, midlong (17–25 cm), very narrow (6–7 cm); rachis stout, straight to flexuous; nodes 5–7, false node usually absent; branches (21–30) medium long and stiff, raised; spikelets 57–78; glumes white, medium short (18–19 mm), fine in texture; florets 2; lemma yellowish white, very short (12–14 mm); nerves 7–9, obscure; palea wide, yellow; spikelet separation by fracture, basal scar absent, occasional medium long basal pubescence present, floret separation by fracture, distal; awns absent; kernel plump; rachilla segment medium long and slender, occasional medium long rachilla hairs present; no hairs on lemma.

Storm King C.I. 1602**Reg. No. 40**

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath; leaf narrow, numerous hairs on leaf margins, medium dark green.

Adult plant.—Midseason; midtall to tall (107–132 cm); culms 1–3, pubescence absent at nodes; plant color medium dark green; leaf wide, ligule present, pubescence absent on sheath and leaves; panicle unilateral, midlong (17–25 cm), and very narrow (5–6 cm); rachis stiff, straight to flexuous; nodes 6–7, false node absent; branches (17–25) medium long, usually stiff, raised; spikelets (25–69); glumes white, midlong (22–26 mm), fine to medium in texture; florets 2; lemma white to yellowish white, midlong (15–17 mm); nerves 9; palea wide, yellowish white; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence absent; floret separation by fracture, distal; awns occasional straight, subgeniculate to twisted, geniculate; kernel very plump (numerous bosom kernels); rachilla segment short to midlong and slender, nonpubescent; no hairs on lemma.

Tartar King C.I. 1599**Reg. No. 41**

Description.—Juvenile growth upright; culm medium stout, pubescence absent on sheath, present on leaf margins; leaf medium wide, dark green.

Adult plant.—Midseason to late; midtall to tall (102–124 cm); culms 2–3, pubescence absent at nodes; plant color medium dark green; leaf midwide, ligule present, no pubescence on sheath or leaves; panicle unilateral, midlong (15–20 cm), and narrow (5–6 cm); rachis straight to flexuous; nodes 6–7, false node present; branches (15–22) medium long, raised in attitude; spikelets 25–68; glumes white, midlong (21–25 mm), fine in texture; florets 2; lemma yellowish white, short to midlong (15–18 mm); nerves 7–9; palea wide, yellow; spikelet separation by fracture, basal scar absent to very obscure, basal pubescence absent; floret separation by fracture, distal; awns occasional to numerous, twisted and geniculate; kernel very plump; rachilla segment medium long and slender, nonpubescent; no hairs on lemma.

White Tartar (White Russian)**C.I. 1614****Reg. No. 42**

Description.—Juvenile growth upright; culm medium to stout, pubescence absent on sheath and leaves; leaf medium narrow, medium dark green.

Adult plant.—Late; midtall to tall (114–147 cm); culms 1–5, midstout, pubescence absent at nodes; plant color medium dark green; leaf midwide, ligule present, no hairs on sheath or leaves; panicle unilateral, midlong (22–25 cm), narrow to medium wide; rachis straight to recurved, slightly flexuous; nodes 6–7, false node absent; branches (16–25) medium to very long, raised; spikelets 33–63; glumes white, long (20–24 mm), fine in texture; florets 2; lemma white, gray flecked, midlong (16–18 mm); nerves 5–7; palea midwide, white to yellow; spikelet separation by fracture, basal scar absent to very obscure, occasional short to long basal pubescence present; floret separation by fracture, distal; awns absent; kernel slender; rachilla segment long and slender, occasional short rachilla hairs present; no hairs on lemma.

SPRING-SOWN HULL-LESS OR NAKED OAT VARIETIES IN THE UNITED STATES

Hull-less oats have been of interest for over 1,500 years, especially in China, but in North America they have never been widely grown. Periodically, however, considerable interest is created in rather local areas by enterprising seedsmen, with seed for sale. This is possible because of the long-held belief that hull-less oats were especially suited for feeding young poultry and livestock (lacking teeth). Consequently their lack of hulls (lemma and palea) made them preferable for young livestock. This idea was somewhat refuted by the studies of Record (1943), whose investigations revealed that some oat hulls proved advantageous when included in the feeds of young poultry. It has long been known that hull-less oats are subject to bin damage by heating. Since Record's publication, few hull-less oats have been released.

The number of hull-less oats produced and released in North America in the past 60 years has not been large. Formerly such oats were especially susceptible to smut, but more recently re-

leased varieties resulting from crosses with smut-resistant oats usually have been smut resistant.

As of 1973, only one variety classed as *Avena nuda* L. has been registered by the American Society of Agronomy. That was James, C.I. 5015, Reg. No. 155. Here, nine varieties of *A. nuda*, both registered and not registered, are discussed (table 9).

Brighton C.I. 4160

C.A.N. 668

Description.—Juvenile growth upright; culm stout, often pink in color, no hairs on culm or sheath; leaf medium wide, few long hairs on margin; color medium dark green.

Adult plant.—Medium late; midtall (110–115 cm); culms 2–3, medium stout, pubescence occasional above and numerous below nodes; leaf midwide, long, drooping; ligule present, some pubescence on sheath and leaf margin; panicle equilateral, medium long (15–25 cm), and widespread; rachis medium long, medium slender, slightly flexuous; nodes 5–7, false node absent; branches (15–20) long, raised to straight, often drooping at tip; spikelets 20–30; glumes white, medium to long (20–26 mm), medium coarse in texture; florets 4–5; lemma yellow, long (18–21 mm); nerves 7–9, nonadherent to groat; palea midwide, white, nonadherent; floret separation by fracture, kernel nuda, no basal scar or pubescence; awns occasional, straight; kernel midplump; rachilla segment long to very long, nonpubescent; no hairs on lemma.

Chinese Hull-less C.I. 1003

Description.—Juvenile growth medium upright; culm medium stout, slightly pink, no hairs on sheath; leaves midwide, no hairs on margins.

Adult plant.—Midseason; tall (122–152 cm); culms 1–4, occasional hairs below nodes; leaf midwide, ligule present, medium dark green, few hairs on sheath and margins; panicle equilateral, medium long (15–23 cm), wide (10–13 cm); rachis slender, straight to recurved; nodes 4–7, false node absent; branches (12–24) very long, straight to drooping; spikelets 16–26; glumes white, very long (22–31 mm), fine in texture; florets 4–6; lemma red, long (20–22 mm); nerves 5–7; palea midwide, dark gray; spikelet separation by semiabscission; basal scar prominent, basal hairs numerous, long; floret separation by basifracture; awns few, straight; kernel slender to plump, nuda; rachilla segment medium to very long, slender to medium wide, nonpubescent; no hairs on lemma.

Fowlds C.I. 1996

Description.—Juvenile growth upright; culms midstout; leaves medium dark green, midwide, sheath and leaf nonpubescent to occasional hairs.

Adult plant.—Early; midtall (100–120 cm); culms 1–3, midslender with slight pubescence at nodes; leaf midwide, medium dark green; ligule present, nonpubescent; panicle equilateral, midlong (16–22 cm), and medium wide; rachis stout, straight, recurved; nodes 4–5, false node absent; branches (13–19) slender, midlong; spikelets 17–27; glumes white, midlong (18–22 mm), fine in texture; florets 2 to numerous (multiflorous); lemma yellow with darker rib at center, long (19–21 mm); nerves numerous; palea midwide, nonadhering (naked), yellow; spikelet separation by fracture, without basal scar or pubescence; floret separation by fracture, kernal nuda, basal scar and pubescence absent; awns numerous, twisted, and geniculate; kernel plump; rachilla segment long, slender, nonpubescent; no hairs on lemma.

James C.I. 5015**Reg. No. 155**

Description.—Juvenile growth upright; culm medium stout, few hairs on sheath; leaf midwide, hairs absent on leaf margins; plant color medium dark green.

Adult plant.—Early; short to midtall (74–117 cm); culms 3–5, medium stout, occasional to numerous hairs above and below nodes; leaf midwide, often raised, ligule present, numerous hairs on sheath and leaves; plant color green; panicle equilateral, midlong (10–20 cm), and wide; rachis usually straight to slightly flexuous; nodes 4–5, false node absent; branches (11–20) medium long, straight to raised; spikelets 16–32; glumes white, midlong (18–22 mm), fine in texture; florets numerous, 4 to 8 usually; lemma white, midlong (15–18 mm), nonadhering; nerves obscure; palea midwide, white; basal pubescence absent; awns occasional, straight; kernel naked, midlong; rachilla segment long to very long and slender, nonpubescent; no hairs on lemma.

Laurel C.I. 2231

Morphologically similar to Liberty, C.I. 845. Resulted from the cross: Banner × Chinese (hull-less) made at Central Experimental Farm, Ottawa, Canada, in 1906.

The variety was distributed in Canada in 1922, 8 years after

Liberty. Compared with other hull-less varieties it is late maturing, has a medium tall, strong straw, and midlong, large kernels.

Liberty C.I. 845

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaf margins; leaf medium wide; plant color medium dark green.

Adult plant.—Midearly; midtall (85–127 cm); culms 2–4, few hairs above and below nodes; leaf medium wide, medium dark green, ligule present, hairs on leaves absent; panicle equilateral, midlong (19–24 mm), and wide; rachis midstout, straight to recurved; nodes 5–6, false node absent; branches (12–20) medium long, straight to raised; spikelets 15–47; glumes white, long (22–27 mm), fine in texture; florets multiple (4–8); lemma white, midlong to long (16–22 mm); nerves very obscure; palea wide and very long, white; lemma and palea nonadhering (hull-less oat); awns occasional, straight; rachilla segment long to very long and slender, occasional to numerous short to medium long hairs on rachilla segment; no hairs on lemma.

Nakota C.I. 2883

Description.—Juvenile growth upright; culm slender, pubescence absent on sheath and leaf margins; leaf narrow, medium dark green.

Adult plant.—Midearly; midtall to tall (99–132 cm); culms 1–3, midstout, pubescence absent at nodes; leaf midwide, ligule present, nonpubescent; plant color medium dark green; panicle equilateral, midlong (15–24 cm), and wide; rachis midslender, straight to slightly flexuous; nodes 5–6, false node absent; branches (14–20) medium to long, straight to raised, sometimes drooping; spikelets 17–30; glumes white, midlong (18–25 mm), fine in texture; florets numerous, 2–8; lemma white, midlong to long (16–21 mm); nerves 7–9; palea midwide, white; lemma and palea nonadhering (hull-less oat); occasional short basal pubescence present; awns occasional, straight, subgeniculate to twisted, geniculate; kernel midplump; rachilla segment long to very long and slender with occasional short rachilla hairs present; no hairs on lemma.

Torch C.I. 7265

C.A.N. 812

Description.—Juvenile growth upright; culm stout, pubescence absent on sheath and leaves; leaf midwide, dark green.

Adult plant.—Midseason; medium tall (120–125 cm); culms 4–6, medium stout, pubescence absent on sheath and at nodes; leaf midwide, dark green, ligule present, no pubescence on leaves; panicle equilateral, midlong (17–18 cm), and wide (14–15 cm); rachis slender, straight to recurved; nodes 5–6, false node absent; branches (16–20) midlong, slender, straight to raised; spikelets 26–30; glumes reddish white, midlong (21–24 mm), fine in texture; florets numerous, 4–8 (nuda); lemma white, very long (22–25 mm); nerves 5–7; palea midwide, white; lemma and palea nonadhering (hull-less oat); awns absent; kernel plump; rachilla segment very long (4–6 mm) and slender, numerous, short rachilla hairs present; no hairs on lemma.

Yenmesh C.I. 1769⁹

P.I. 21672

Description.—Juvenile growth middecumbent; culm midstout, sheath and leaf nonpubescent; leaf midwide, grayish green.

Adult plant.—Midseason; short to midtall (95–100 cm); culms 2–3, midstout, nodal pubescence absent above, occasional few hairs below; leaf midwide, ligule present, few hairs on sheath and leaf margin; panicle equilateral, midlong (16–20 cm), and midwide (12–15 cm); rachis midlong, straight, slender, slightly flexuous and slightly recurved at tip; nodes 6–8, false node absent; branches 20–25, midlong, slender, straight to slightly raised; spikelets 33–44; glumes white, midlong (19–22 mm), fine in texture; florets 3–5; lemma white, long (19–22 mm); nerves 7; palea midwide, white, nonadherent; floret separation by fracture, occasional short or no pubescence on base of lemma; awns numerous, usually twisted and geniculate; kernel midplump, nonpubescent; rachilla segment long to very long (3–5 mm), usually nonpubescent; no hairs on back of lemma.

OAT GERM PLASM VARIETIES

The Crop Science Society of America in 1967 started the registration of Germ Plasm (G.P.) oats and assigned such G.P. numbers. As of December 1972, four of these have been registered (table 10.) Such oats are considered sources of genes for oat improvement.

⁹ Stanton (1955, p. 55) indicates Yenmesh is a “small naked oat,” apparently having $7n$ chromosomes and not a hexaploid, $21n$, as are all other naked oats mentioned herein.

TABLE 10.—*History of registered oat germ plasm in the United States*

Variety	C.I. No.	G.P. Reg. No.	Year received, last cross made, or selected ¹	Selected, crossed, or introduced	Source variety or parent of cross	Year released	Where released	Source or name of breeder	
Dade ²	-----	7495	1	1951(C)	F. A. Coffman	Cimarron 4 × Hajira × Joannette 3 × Atlantic 2 × Clinton ² × Santa Fe.	1959	Mo.	J. M. Poehlman, F. A. Coffman.
Hickory ²	----	7490	2	1951(C)	F. A. Coffman	Nysel × Hairy Culberson.	1959	Mo.	J. M. Poehlman, F. A. Coffman.
Calif. C.C. II. ³	-----		3	-----	<i>Avena sativa</i> and <i>A. byzantina</i> cultivars crossed with <i>A. fatua</i> .	1969	Calif.	C. A. Suneson.	
Eta ⁴	-----	8347	4	1962(S)	F. A. Coffman	Selected from Eaton	1970	USDA	F. A. Coffman.

¹ C=cross; S= selected.² Fall sown.³ Bulk of different types.⁴ Spring sown.

Dade C.I. 7495**Reg. No. G.P. 1**

Description.—Juvenile growth very decumbent; culm medium stout; leaves midwide, medium dark green, pubescence on sheath and margins.

Adult plant.—Late; midtall (115–125 cm); culms 3–4, midstout, pubescence above and below nodes; leaf narrow, ligule present; few hairs present on sheath and leaf margins; leaf medium dark green; panicle equilateral, medium long (20–25 cm), and midwide; rachis straight to slightly flexuous; 6–7 nodes, false node absent; branches 12–15, medium long, slender, straight to drooping; spikelets 19–25; glumes red, midlong (20–25 mm), coarse in texture; florets 2; lemma grayish red, midshort (15–16 mm); nerves 7, usually prominent; palea midwide, gray; spikelet separation by fracture, basal scar absent to occasional very obscure, basal pubescence absent; floret separation by fracture, usually distal; awns occasional, usually straight; kernel midplump; rachilla segment midlong, pubescence very occasional, short; no hairs on lemma.

Hickory C.I. 7490**Reg. No. G.P. No. 2**

Description.—Juvenile growth very decumbent; culm midstout; leaves midwide, medium dark green with some pubescence on sheath and leaf margins.

Adult plant.—Late; midtall (112–120 cm); culms 3–4, midstout, pubescence occasional to numerous both above and below nodes; leaf midwide, ligule present, occasional pubescence on sheath and leaf margins; panicle equilateral, midlong (18–25 cm), and midwide; rachis straight to slightly flexuous; nodes 5–7, false node absent; branches (13–17) midlong, straight to drooping; spikelets (15–30); glumes white, midlong (18–20 mm), fine in texture; florets 2; lemma gray, midlong (15–17 mm); nerves 7; palea midwide, grayish red; spikelet separation by fracture to semiabscission, basal scar absent to very obscure; pubescence usually absent; floret separation by fracture, distal or heterofracture; awns occasional to numerous, subgeniculate to twisted, geniculate; kernel midplump; rachilla segment midlong and medium wide, nonpubescent; no hairs on lemma.

Calif. C.C. II**Reg. No. G.P. 3**

Description.—A very heterogeneous population which serves as a gene pool into which all nonshattering segregates from *Avena sativa* and *A. byzantina* crosses with *A. fatua* have been composited. Progenies of all such crosses made in California from 1947 to 1969 were included.

The *A. sativa* or *A. byzantina* parents were nullisomics or monosomics.

The gene pool matures early under California conditions.

Eta C.I. 8347**Reg. No. G.P. No. 4**

Description.—Juvenile growth upright; culm very stout; slight or no pubescence on sheath or leaf; plant medium light green, often tinted slightly pink.

Adult plant.—Midearly; short (80–100 cm); culms 4–6, extremely stout, slight or no hairs on nodes, sheath, or leaf; leaf medium wide, attitude decidedly raised, ligule present, plant color medium light green, may have a slightly reddish tinge; panicle equilateral, short (15–21 cm); rachis stout, stiff, straight to very slightly flexuous; nodes 6–8, false node absent; branches (20–28) short to midlong, unusually stout, stiff and decidedly raised in attitude; spikelets 40–70; glumes very light red to yellow, midlong (19–22 mm), medium coarse in texture; florets 2, often 3; lemma usually short (15–16 mm), light yellow to white; nerves 5–7, obscure; palea midwide to wide, yellowish white; spikelet separation by fracture to semiabscission, basal scar usually absent to extremely obscure, few to numerous extremely short basal hairs present; floret separation usually by fracture, distal, but sometimes by heterofracture; awns very occasional, straight; kernel medium plump; rachilla segment medium long (2–2.5 mm), medium wide, nonpubescent; no hairs on lemma.

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